NOV 3 1917

THE BOSTON Medical and Surgical JOURNAL

OFFICIAL ORGAN OF THE MASSACHUSETTS MEDICAL SOCIETY AND OF THE NEW ENGLAND SURGICAL SOCIETY

VOL. CLXXVII
No. 18

THURSDAY, NOVEMBER 1, 1917

Single Copies 15 Cents
Five Dollars per Annum

CONTENTS

STUDIES IN SERUM THERAPY

THE USE OF NORMAL BLOOD SERUM, PARTICULARLY WITH REFERENCE TO THE TREATMENT OF WOUNDS. STUDIES IN SERUM THERAPY II. *By Timothy Leary, M.D.*, Boston.

THE PREPARATION OF BLOOD SERUM FOR USE. STUDIES IN SERUM THERAPY III. *By Timothy Leary, M.D.*, Boston, and *Frank H. Dunbar, M.D.*, Boston.

ANAPHYLACTIC REACTIONS TO NORMAL SERA. STUDIES IN SERUM THERAPY IV. *By Timothy Leary, M.D.*, Boston; *Frank H. Dunbar, M.D.*, Boston; and *John W. Watson, M.D.*, Boston.

A CASE OF STREPTOCOCCUS MENINGITIS SUCCESSFULLY TREATED WITH NORMAL (HUMAN) SERUM. STUDIES IN SERUM THERAPY V. *By Francis P. McCarthy, M.D.*, Boston.

THE TREATMENT OF WOUNDS WITH NORMAL (BEEF) SERUM. STUDIES IN SERUM THERAPY VI. *By Joseph H. Shortell, M.D.*, Boston; *William F. Cotting, M.D.*, Boston; and *Timothy Leary, M.D.*, Boston.

ORIGINAL ARTICLE

PHYSICAL EXAMINATION OF FACTORY EMPLOYEES: TWO THOUSAND CONSECUTIVE CASES AND THE DEFECTS FOUND. *By Raymond W. Cutler, M.D.*, Worcester, Mass.

THE MASSACHUSETTS MEDICAL SOCIETY

BRIEF REPORTS OF HEARINGS ON HEALTH INSURANCE AT BOSTON, SEPTEMBER 26, 1917, AND AT LAWRENCE, OCTOBER 10, 1917.

EDITORIALS

THE DETERMINATION OF RENAL FUNCTION.

A PORTABLE HOSPITAL UNIT.

AN APPEAL TO THE PROFESSION.

For complete table of contents, see first text page.

October Surgical Clinics of Chicago

CONTENTS

CLINIC OF DR. A. D. BEVAN, *Presbyterian Hospital*
Benign Tumors of the Breast, Chronic Inflammations and Carcinoma.

CLINIC OF DR. ALBERT J. OCHSNER, *Augustana Hospital*
Talipes Equinovarus following Acute Anterior Poliomyelitis.
Varicose Veins of the Leg.
Postoperative Tetany of Sternocleidomastoid muscle.

CLINIC OF DR. JOHN RIDLON, *Mercy Hospital*
Hip Disease.

CLINIC OF DR. A. F. HALSTEAD, *St. Luke's Hospital*
Hereditary Deformans Chondral Dysplasia.

CLINIC OF DR. MALCOLM L. HARRIS, *Henrotin Memorial Hospital*
Hernia of the Breast.

CLINIC OF DR. E. WYLLYS ANDREWS, *Mercy Hospital*
Hemangioma of Brain, Inoperable; Treated by Boiling Water Injections and Hot Metal Point.

CLINIC OF DR. D. B. PHEMISTER, *Presbyterian Hospital*
Brain Cyst following Skull Fracture.

CLINIC OF DR. NELSON M. PERCY, *Augustana Hospital*
Partial Evisceration through Vagina during Attempted Abortion.

CLINIC OF DR. CARL BECK, *North Chicago Hospital*
Tendo- and Neuroplasty.
Elephantiasis and the Handley Operation.

CLINIC OF DR. H. L. KRETSCHMER, *Alexian Brothers Hospital*
Hydronephrosis due to Kidney Stone.
Ureteral Calculus—Oil Injections.

CLINIC OF DR. THOMAS J. WATKINS, *St. Luke's Hospital*
Cystocele, Uterine Prolapse, Retroflexion, and Rectocele Repaired by Plastic Operation.
Radium in Hemorrhage at Menopause.

CLINIC OF DR. D. N. EISENDRATH, *Cook County Hospital*
Complications of Appendicitis.
Clinical Importance of Congenital Anomalies of Kidney.

CLINIC OF DR. HUGH MCKENNA, *St. Joseph's Hospital*
Perforated Duodenal Ulcer.
Early Recognition and Treatment of Acute Appendicitis.

CLINIC OF DR. HARRY E. MOCK, *St. Luke's Hospital*
Bichlorid of Mercury Poisoning Operated for Gastric Ulcer.

CLINIC OF DR. DAVID C. STRAUS, *Michael Reese Hospital*
Hammer-toe—Modified Jones' Operation.

CLINIC OF DR. KELLOGG SPEED, *Cook County Hospital*
Hematuria in Appendicitis.

Surgical Clinics of Chicago. Issued serially, one octavo of 225 pages, illustrated, every other month. Per Clinic Year (February to December): Cloth, $14.00 net; Paper, $10.00 net.

W. B. SAUNDERS COMPANY — Philadelphia and London

Entered at the Post-office at Boston as second-class matter.

MULFORD
FOR THE CONSERVATION OF LIFE
LABORATORIES

"An Ounce of Prevention Is Worth a Pound of Cure"

Immunize your patients against Influenza and "Colds" NOW. **Do not wait** until respiratory affections are prevalent.

Influenza Serobacterin Mixed Mulford will give immunity from "Colds" and Influenza to a large percentage of patients infected by the organisms used in preparing the Serobacterin.

Supplied in packages containing four aseptic glass syringes as follows:

	Syr. A	Syr. B	Syr. C	Syr. D
B. influenzæ	125	250	500	1000 million
Staphylococcus albus	125	250	500	1000 million
Staphylococcus aureus	125	250	500	1000 million
Streptococcus	125	250	500	1000 million
Pneumococcus	125	250	500	1000 million
M. catarrhalis (group)	125	250	500	1000 million

Mulford Typho-Serobacterin

For Immunization and Treatment of Typhoid Fever

The value of immunizing against typhoid fever is established. The results secured by the Armies and Navies of all Nations now at war absolutely prove its efficiency. Supplied in packages of three aseptic glass syringes, graduated as follows:

	1st Dose	2nd Dose	3rd Dose
Bacillus typhosus	1000	2000	2000 million
B. paratyphosus "A"	500	1000	1000 million
B. paratyphosus "B"	500	1000	1000 million

Also supplied in 4-syringe therapeutic package and 5 c.c.

Typho-Serobacterin Mixed is coming into general favor for immunization as well as treatment. It affords immunity against the typhoid and the paratyphoid "A" and "B" bacilli present in about 10% of typhoid cases.

Literature describing method of treatment and dosage, together with special educational bulletins for distribution to your patients, sent on request.

H. K. MULFORD CO., Philadelphia, U. S. A.

Manufacturing and Biological Chemists 22415

1917

The Boston Medical and Surgical Journal

TABLE OF CONTENTS

November 1, 1917

STUDIES IN SERUM THERAPY

THE USE OF NORMAL BLOOD SERUM, PARTICULARLY WITH REFERENCE TO THE TREATMENT OF WOUNDS. STUDIES IN SERUM THERAPY. II. *By Timothy Leary, M.D.*, Boston. 611

THE PREPARATION OF BLOOD SERUM FOR USE. STUDIES IN SERUM THERAPY. III. *By Timothy Leary M.D.*, Boston, and *Frank H. Dunbar, M.D.*, Boston. 617

ANAPHYLACTIC REACTIONS TO NORMAL SERA. STUDIES IN SERUM THERAPY. IV. *By Timothy Leary, M.D.*, Boston; *Frank H. Dunbar, M.D.*, Boston; and *John W. Watson, M.D.*, Boston 618

A CASE OF STREPTOCOCCUS MENINGITIS SUCCESSFULLY TREATED WITH NORMAL (HUMAN) SERUM. STUDIES IN SERUM THERAPY. V. *By Francis P. McCarthy, M.D.*, Boston. 621

THE TREATMENT OF WOUNDS WITH NORMAL (BEEF) SERUM. STUDIES IN SERUM THERAPY. VI. *By Joseph H. Shortell, M.D.*, Boston; *William F. Cotting, M.D.*, Boston; and *Timothy Leary, M.D.*, Boston. 622

ORIGINAL ARTICLE

PHYSICAL EXAMINATION OF FACTORY EMPLOYEES: TWO THOUSAND CONSECUTIVE CASES AND THE DEFECTS FOUND. *By Raymond W. Cutler, M.D., Worcester, Mass.* 627

HARVARD MEDICAL SCHOOL

THE FUTURE OF MEDICINE. *By President Emeritus Charles W. Eliot*, Cambridge, Mass. 631

ADDRESS. *By G. F. Freeman, Surgeon, U.S.N.* 632

BOOK REVIEWS

First-Aid to the Injured and Sick: An Advanced Ambulance Handbook. By F. J. Warwick, B.A., and A. C. Tunstall, M.D. 634

A Text-Book of First-Aid and Emergency Treatment. By A. C. Burnham, M.D. 634

Food for the Worker. By Frances Stern and Gertrude T. Spitz. 634

EDITORIALS

THE DETERMINATION OF RENAL FUNCTION. 635

AN APPEAL TO THE PROFESSION. 636

A PORTABLE HOSPITAL UNIT. 636

MEDICAL NOTES. 637

THE MASSACHUSETTS MEDICAL SOCIETY

NOTES TAKEN AT A HEARING BEFORE THE SPECIAL COMMISSION ON SOCIAL INSURANCE AT THE STATE HOUSE, BOSTON, SEPTEMBER 26, 1917. 639

BRIEF REPORT OF THE HEARING ON HEALTH INSURANCE BEFORE THE MASSACHUSETTS COMMISSION ON SOCIAL INSURANCE, AT LAWRENCE, OCTOBER 10, 1917. *By W. H. Merrill, M.D.*, Lawrence, Mass. 641

NOTES FROM THE DISTRICT SOCIETIES. 642

MISCELLANY

RESOLUTIONS ADOPTED AT MEETING OF NORFOLK SOUTH DISTRICT MEDICAL SOCIETY, THURSDAY, OCTOBER 4, 1917. 642

POLIOMYELITIS IN NEW YORK CITY IN 1916. 643

DR. SEDGWICK OF M. I. T. URGES SANITARY STUDIES. 644

PROGRESS IN COMBATING HOOKWORM. 645

COST OF HEALTH SUPERVISION IN INDUSRTY. 645

RECENT DEATHS. 646

Original Articles.

THE USE OF NORMAL BLOOD SERUM, PARTICULARLY WITH REFERENCE TO THE TREATMENT OF WOUNDS.

STUDIES IN SERUM THERAPY.* II.

BY TIMOTHY LEARY, M.D., BOSTON.

[From the Laboratories of Pathology and Bacteriology of the Tufts College Medical School.]

INTRODUCTION.

THE materia medica is made up in large part of substances which have been wrested by more or less complex methods from the vegetable and mineral kingdoms.

The animal kingdom, containing our nearest neighbors biologically, has been, until recent years, overlooked in large part in our search for medicinal agents. In this limited period, however, there has been discovered the largest group of specific agents known to medicine, whose number is increasing as our researches extend.

In addition to the natural products of animal origin, *e.g.*, extracts of the ductless glands, we have succeeded, by artificially stimulating the defensive machinery of animals, in producing a group of specific anti-bacterial and antitoxic agents, whose evolution is the flower of modern research in medicine.

When man fails, through his own natural powers, to supply the protective substances needed to overcome a parasite or its products, we turn to the creatures which respond to infection as man does, and which through their more natural method of existence are able to call into being the required specific protective bodies in greater quantity than weaker man can produce.

It will be noted that in the elaboration of these antisera by animals, the function of man consists only in introducing the bacterium or its products into the healthy animal. The animal does the rest, and does it through a defensive mechanism which is ready to respond to the injection of toxic substances, perhaps unknown to it in its normal existence. The effort by the animal body to neutralize the noxious agents leads to the formation of the specific antisubstances which we use.

The life of the animal, like the life of man, is a constant struggle against parasitic agents which are endeavoring to invade its body, and whose success in this invasion usually results in disease and perhaps death.

Progress in civilization has, through hygienic measures, led to protection of man against contact with harmful agents; through the discovery of protective substances produced by healthy living animals, his struggle against infectious processes is being greatly strengthened; but the stress of the artificial life which civilization produces has resulted in a weakening of his own natural defenses. The free living animal, on the other hand, leading a hygienic life, has conserved its natural resources.

* For the first paper in this series see BOSTON MEDICAL AND SURGICAL JOURNAL, 1908, clix, 73. The expenses of this work have been borne out of funds earned by the Department of Pathology and Bacteriology of the Tufts College Medical School.

We have been led, because of the brilliant results obtained by specific antisera, to think of animals, such as the horse, as producers of specific antisera only. It should be remembered, however, that the horse destroys the diphtheria bacillus or its toxin, not because of the possession of specific defenses against these agents, but because of a protective machinery, armed against *any* invader, and producing the specific antibodies needed on call.

Similarly, the domestic animals resist infection by the pus-producing bacteria which infect man, not as the result of possessing specific antibodies against these bacteria, but by virtue of a defensive machinery which attacks *all* invading agents. We should think of these animals, then, as possessing already at any time natural protective properties, having power against *any* parasitic agent, but capable of responding to artificial stimuli by producing in excess specific antibodies against the particular agent injected.

The agencies of defense in animals correspond to the similar agencies in man. We can recognize lytic, precipitating, agglutinating, opsonic and phagocytic properties. All of these agencies, whether general or specific, whether natural or arising as the result of artificial stimulation, are contained in concentration in the blood; and all of these, except the phagocytes, are contained in the serum. This is a matter of common agreement.

From this standpoint, then, the healthy animal which comes to slaughter for food; whose body passes, not a clinical examination, but a detailed anatomical examination of its organs and tissues by an expert, represents the summation of all of the factors needed to resist disease. It has come through a lifetime beset with parasitic enemies, and has emerged unscathed from the battle by virtue of its own physical powers.

It has always seemed to the writer that the serum of such an animal was a precious fluid, whose properties should be used to assist mankind in its struggle against disease.

WHAT ARE THE PROPERTIES OF NORMAL SERUM?

(A complete review of the properties of serum would embrace a consideration of all of the physical and chemical activities of the body, impossible in the limits of this paper. Reference is made, therefore, only to properties needing consideration from our standpoint.)

1. It is the ideal physiological saline. Artificial salines are only imitations, because it is impossible to reproduce the mineral formula of the serum in aqueous solutions without the introduction of proteids, since some of its salts are in organic combination with proteids. There is close correspondence, qualitatively and quantitatively, between the salts of animal and human sera, which are, therefore, isotonic.

2. It is an antibacterial agent. The first discovery of substances antagonistic to bacteria in the animal body was made by Nuttall,[1] who showed that normal serum possessed the power of destroying bacteria. This action was not specific, but was exhibited against bacteria of many kinds introduced into the fluid. The Alexin (Buchner[2]) which produced this action was a labile body, destroyed by heat (56° C.), easily exhausted by saturation with bacteria, and disappearing if the serum was kept. It was inactive against staphylococci. Later Wright[3] demonstrated the presence of non-specific opsonins in normal sera.

3. It is the repository of the specific antibacterial and antitoxic substances produced as a result of natural infection or intoxication, or of the artificial introduction of antigenic substances.

Becht and Leuckhart[4] have shown that the circulating antibodies are produced in the hemopoietic organs and not in the tissue cells in general. Wherever these substances may be produced they come to be contained in concentration in the blood serum, together with the natural immune bodies.

4. It is a repository of the enzymes produced by the body.

It contains diastases, as well as maltase and other glycolytic enzymes, oxidases, catalases, lipases, rennin and a group of proteolytic enzymes, together with antienzymes.[5]

For a study of the antitryptic action of the serum, the reader is referred to the series of papers by Jobling and his associates, largely published in the *Journal of Experimental Medicine*. From their studies of the antienzyme action of the serum in infection, they conclude that its antiferment power depends upon the amount of unsaturated lipoids present in a highly dispersed state,[6] and find that a low "infection index," observed in various conditions, including carcinoma, pregnancy and following vaccine therapy, is associated with a relatively high antiferment index of the serum.

In addition to the substances mentioned, the blood serum is the carrier of the secretions of the ductless glands.

5. It contains coagulating ferments (thrombin), which are capable of stopping hemorrhage in the hemorrhagic diseases, where the tendency to hemorrhage is general, or where the hemorrhage is local, in the form of oozing (Weil[7]). We have furnished rabbit serum to physicians and hospitals for years for this purpose. (See Paper I, this series.) The value of serum from this standpoint progressively diminishes with its age.

6. Serum or plasma is the agency which has permitted the cultivation *in vitro* of the tissues of the animal body. For this purpose an homologous serum is best, although not essential.[8]

7. It contains proteid substances which, when introduced into the animal body, will provoke specific immunity, or the related change anaphylaxis. In other words, its albumens, like all others, are capable of acting as antigens. In

addition to exciting a specific immune response, its injection produces a non-specific reaction, now being used widely in therapy, which is discussed in some detail later in this paper.

8. With other substances, it possesses the property of provoking a local or general leucocytosis when introduced into the animal body, and is the most desirable agent to use for this purpose. (*Vide infra,* Petit.[9])

RÉSUMÉ.

Normal serum, then, may be accepted as a natural physiological solution, readily miscible with the tissue secretions, and bland in its action, apart from certain toxic and anaphylactic properties, now regarded as useful under proper control (see Paper IV); it possesses natural antibacterial properties; it is the storehouse of the specific antibodies; it contains ferments capable of digesting tissue detritus and exhibiting other useful activities; it is employed successfully in controlling hemorrhage other than that form (rhexis) requiring mechanical control; it is fitted to serve as a culture medium for tissue; it is able to excite the protective machinery in a non-specific manner, useful in therapy; it provokes a desirable leucocytosis, valuable in the treatment of infections.

THE POSSIBLE USES OF NORMAL SERUM IN THERAPY.

In addition to the applications of normal serum mentioned, it has been used in the treatment of disease by mouth administration.[10] For present purposes we must limit ourselves to a consideration of its possible uses in the treatment of wound sepsis.

The conditions under which the present war is being conducted have revolutionized war surgery.

Trench warfare has resulted in inoculation of the mud of the trenches with parasitic organisms, and the infrequently changed clothing, and rarely bathed skins of the men in the trenches, are rich in bacteria. Comparatively clean rifle bullet wounds have been replaced in large part by shell and shrapnel wounds, accompanied by the driving of foreign bodies, fragments of clothing and skin, into the lacerations produced, so that clean wounds are the exception.

Modern surgery in civil life is carried out in large part, under aseptic conditions, which have made possible a wonderful development in the mechanical aspect of the art. Dealing almost wholly with clean cases, the surgeon, after carrying out the necessary operative procedures in the exceptional septic case, usually turns over its care to assistant or house officer, who, in turn, oftentimes delegates his responsibilities to the nurse. This attitude has led to little progress in the treatment of septic wounds from the time of our Civil War up to the present conflict. However, certain cardinal principles of treatment are established: the removal of foreign bodies and dead tissue, drainage, and the use of antiseptics.

There can be no discussion about the first two of these principles. Our problem deals with the third.

WHAT ARE THE REQUIREMENTS OF AN ANTISEPTIC AGENT?

1. *It should be able to kill or prevent the growth of bacteria.* If this were the only requirement of an antiseptic, it would be satisfied by a large number of chemical substances. We are accustomed to test the efficiency of antiseptics *in vitro* and conclude, if results are satisfactory in the test tube, that similar results will be obtainable *in vivo.* The history of septic wound treatment is a record of hopes raised by test tube results, and dashed by actual experiences in treatment, either because the agent used was too toxic, or because neutralization by the proteids of the cells and secretions rendered it inert. The constant unsuccessful search for an efficient intestinal antiseptic illustrates the difficulty of this problem.

The human body is made up of cells, which consist of cytoplasm and nuclear material, corresponding closely in composition to the substances making up the bodies of bacteria. These substances are injured equally in cell and bacterium when harmful agents are applied. Germicides act by abstracting water and then coagulating the cell cytoplasm, and act in this manner not only on the bacterium, but also on the cell.

Therefore a second requirement of an antiseptic is:

2. *It must not injure cells.*

The cells are bathed in lymph, which may give them some protection from the antiseptic, while the bacteria, if free, suffer. Bacteria in wounds, however, become quickly bathed in the wound secretions and may invade the cells or lymph spaces between them. It is conceivable that the union of cells in masses may lead to mass protection, and that the cells may interact by their secretions to protect one another, while the unicellular bacterium suffers from its isolation.

The most successful antiseptics are used in very dilute solutions, whose active agents are rapidly neutralized and rendered inert by organic union with the proteids of the wound secretions on contact. They must be applied in such a way that new and new relays of the active agent are being constantly supplied to the surface of the wound. In this way the mechanical removal of the wound secretions, and the exposure of tissue cells and bacteria by the washing action of the menstruum used, is added to the antiseptic effect of the active agent. Antiseptics of this type represent an effort to do a minimal amount of harm to the cells, with a

maximum effect on the bacteria. Their application requires some chemical expertness, the use of more or less cumbersome apparatus, and a development of technic not always possible at the front under present war conditions. Moreover, results of their use are not always satisfactory.[11]

We are prone to forget, in our study of antiseptics, that the human body, after all, heals septic processes oftentimes by its own powers, without the aid of antiseptics, particularly if free drainage is established. Sometimes it accomplishes this even in the face of meddlesome antisepsis. We forget that what we call asepsis does not indicate complete freedom from bacteria. It is recognized that perfect disinfection of the skin is practically impossible. Nobody believes that a part of the peritoneal cavity, exposed for a long period during operation, remains absolutely free from bacteria. Aseptic practice is successful because the dosage of bacteria is cut down to the minimum, and the natural defenses take care of the rest.

If we consider the natural defenses as agencies in the protection of wounds, it is evident that we must add another specification to the requirements of an ideal antiseptic.

3. *Its action must not be harmful to the natural wound defenses; rather it must serve to increase their efficiency.*

Wright[12] and others have recommended the use of hypertonic saline solutions for the purpose of drawing lymph and other secretions to the wound surface. Sodium citrate solutions have also been used to prevent clotting of the wound secretions. These agents furnish unsatisfactory test tube (carbolic coefficient) reactions against bacteria, but experience in their use apparently justifies claims as to their value.

An additional requirement of a practical *war* antiseptic is that:

4. *The technic of its application must be simple and require little or no apparatus.*

This needs no discussion.

Practical considerations make it also desirable that the agent used be easily obtainable in quantity and inexpensively.

HOW DOES SERUM SATISFY THESE REQUIREMENTS?

(The numbers refer to the antiseptic requirements previously laid down.)

1. Freshly drawn normal serum has bactericidal properties, dependent upon a labile antisubstance, which, moreover, is easily saturated and rendered inactive. In this respect it resembles the weaker antiseptic agents. After being rendered inactive, it may serve as a culture medium, particularly for a group of serophilic saphrophytic bacteria. It is not a good culture medium, except in dilution, for the pus-producing bacteria. Beef serum exhibits little, if any, bactericidal action against the pyogenic staphylococci. When used under conditions corresponding as closely as they can be approximated *in vitro* to wound conditions, its powers to aid in the killing of bacteria are more evident (opsonins), but even then its action in the test tube is not adequate to account for the results obtained in practice. Heating to 56° C. destroys its natural opsonic activity, so that this element is removed from discussion, with reference to its practical use. Efforts to study the possible interaction of beef serum with human serum and leucocytes are unsatisfactory *in vitro*, because clotting of the mixture arises, unless the leucocytes obtained from citrated blood are washed free from all traces of plasma, and so placed under artificial conditions. In other words, it is impossible in test tube experiments to reproduce the actual relations of beef serum, human lymph or serum, leucocytes and bacteria as they occur in wounds. Some ingenious procedure such as Wright[12] has devised for studying the anti-bacterial power of wound secretions may ultimately solve the problem. At present, however, we are thrown back upon the leucocytogenic powers described by Petit[13] (*vide infra*) to account for the activities produced by the application of normal serum.

2. A substance which can be used to cultivate tissue, even of an alien species, outside of the body (Lambert and Hanes, *l.c*), should not do harm to tissue cells. The application of beef serum to wound surfaces, particularly where the surface was large, in our cases (see Paper VI, this series) was accompanied, according to the testimony of patients, by a soothing sensation of comfort which continued. The best evidence of the bland character of serum is supplied by Case 61, Paper VI. Many unsuccessful attempts have been made to cover in granulating surfaces by the implantation of plucked hairs. The small amount of epithelium from the hair follicle, which adheres to the root of the hair, usually quickly succumbs to the sepsis which arises from the bacteria which are also implanted with the hair. An agent which cannot only control the sepsis, but also favor the growth of the epithelium, cannot be harmful and must possess antiseptic properties. (It will be noted that this case was treated as an outpatient.)

3. While our use of beef serum on wounds is the first recorded, the literature discloses a series of papers by French writers, largely by Raymond Petit,[9] on the use of horse serum in sepsis.

USE OF HORSE SERUM IN SEPSIS.

Petit's experiences, extending over the period since 1901, led to the production of a book[13] on the subject, which is prefaced by a warm commendation by Metchnikoff, under whom Petit had worked. Influenced by the search for leucocytogenic agents stimulated by Metchnikoff's studies in phagocytosis, Petit, having demonstrated that a defensive leucocytosis

would be established in the peritoneum of the guinea pig following the introduction of heated horse serum, began its use in human therapy. It is impossible adequately to review his splendid work here. Suffice it to say that he has used heated horse serum successfully in the treatment of several hundred cases, embracing all of the conditions met with in general surgical, gynecological and obstetrical practice. It is his custom, even in clean operations, to leave 20 cc. of horse serum in the peritoneal cavity before closing the abdomen. He reports that he has never seen evidences of anaphylaxis, although the serum has been used in doses of 20 cc. or more, in both pleura and peritoneum, and although the intervals between applications of the serum have extended in some cases to months.

In an appendix* he advocates the use of horse serum in war surgery, and records 11 cases, mostly of fetid septic wounds, several with gangrene, with good results.

The lack of horses available for the production of serum under present circumstances in France, is probably responsible for the limited use of this agent in war sepsis. Even under ordinary circumstances horse serum obtained from stabled animals, which are kept only for its production, is expensive.

NON-SPECIFIC REACTIONS.

Recently much attention has been given to a non-specific reaction which follows the introduction of various proteid and other substances into the body, as a means of stimulating or awakening the slumbering, protective machinery to respond, not in a specific fashion to the proteid injected, but in a general manner. In vaccine therapy it has long been recognized that injections of bacterial vaccines could be followed not only by a specific response to the injected bacteria, but also by a more general response in the form of improvement in associated processes, not due to the specific organism. The constancy with which injections of Staphylococcus Aureus vaccine are followed by a feeling of well-being, and a disappearance of symptoms due to associated chronic processes, is an example in point. The successful treatment of many cases of hay fever due to vegetable proteids, by the use of bacterial vaccines, should be mentioned.

The work of Shafer in the treatment of infections by the intravenous injection of various bacterial proteids was given little attention by scientific investigators in this country, in part because of the frankly non-specific character of the reactions sought (notably by the mixed proteid preparation); in part because of the method of its introduction here; and also because of the dangerous reaction to which the method sometimes gives rise. German investigators recognized, however, that a new therapeutic procedure had been discovered, and have developed a school of what is known as "febrile therapy." For the rather extensive literature on the subject, the reader is referred to the papers of Jobling and Peterson[14] and Miller.[15]

The early work deals with attempts, successful in a considerable percentage of cases, to produce a critical termination in typhoid fever by intravenous typhoid vaccine. Later Kraus[16] obtained similar results with B. Coli vaccine in typhoid. The success of this and other non-specific agents led to the use of various proteid substances, including horse and fowl sera, milk, proteoses, and also non-proteid agents in the treatment of low-grade infections, particularly rheumatoid arthritis. Intravenous injection has been practised by most investigators, but much work has been carried out in Germany with sterile milk, injected into the glutei.

The injection is followed, within a few hours at most, by chills and a febrile reaction, whence the name "febrile therapy." Most authorities agree that a febrile reaction has a favorable influence on infection. Winslow, Miller and Noble[17] have shown that lower temperatures would seem to retard the formation of antibodies. That a febrile reaction is not necessary, is claimed by Friedlander,[18] who treated trachoma by gluteal injections of milk, and obtained good results with only slight increase of temperature. It is generally accepted, however, that a febrile reaction is an essential element in the treatment.

The reaction is accompanied by a transitory leucopenia (due to polynuclear reduction), followed by a leucocytosis, which in Miller's cases sometimes reached 100,000 or more, but as a rule ran from 15,000 to 20,000.

Because of the violent reactions produced, this treatment is contraindicated in patients with hypertension, marked valvular lesions or myocardial changes, in alcoholics and in pregnancy.

This method of treatment has been reviewed at some length here because a non-specific proteid reaction may account *in part* for the results obtained with normal serum therapy. That Petit's results are not due to a febrile reaction is indicated by a study of his cases. No such reactions as are usual in febrile therapy are recorded. He believes, and the evidence justifies his belief, that his results are due to the production of a local leucocytosis at the point of application of the serum, which is accompanied by a greater or less general leucocytosis, depending upon dosage and the opportunity for absorption. There can be no question from our own experience, that on an inactive wound surface, the application of serum is followed within 24 hours by a change in the character of the wound secretions. In indolent processes, an acellular serous discharge containing large numbers of bacteria may be replaced by a seropurulent fluid in which leucocytes in active

* The publication of Petit's book was delayed on account of the beginning of the war. This delay evidently permitted of the addition of a short appendix on war sepsis.

phagocytosis are abundant. This reaction was a source of embarrassment to us in our early application of serum. The surgeon, who saw a relatively clean-looking indolent ulcer replaced by a suppurating surface in 24 hours, often concluded that the method was valueless and ordered an immediate change in treatment. The delivery of fresh leucocytes to the surface results in rapid destruction of the bacteria by phagocytosis. As the need for leucocytes decreases, the surface of the wound becomes drier and the secretions become serous. Granulations are promptly established, and the indolent surface becomes a fresh, rosy granulating area, ready for grafting.

ASEPTIC RATHER THAN ANTISEPTIC TREATMENT OF WAR WOUNDS.

Bad results may follow the use of antiseptics in fresh wounds, due either to harmful chemical action on the exposed cells, or, in the case of the watery antiseptics, the dilution of the wound secretions or their removal by the washing effects of the fluid. For this reason, modern practice is tending more and more strongly in the direction of the abandonment of antiseptic agents, unless a wound be frankly septic. After the removal of foreign bodies and dead tissue, and the cleansing of the surfaces, the wound is immediately closed, where possible.

The standard French practice, growing in favor with the English R. A. M. C., under the stimulating advocacy of Sir A. E. Wright, is to place in the wound, before closure, hypertonic saline solution for the purpose of stimulating the wound defenses.

This procedure depends wholly for its success upon the natural defenses of the individual, the only extraneous agents used being applied for the purpose of stimulating these defenses. In other words, it consists in the practice of asepsis rather than antisepsis, and its outcome bids fair to accomplish as much for progress in the treatment of fresh wounds as aseptic practice has done for elective surgery.

Normal serum lends itself to use in this connection as the ideal agent. Its application attracts to the surface of the exposed tissues, not so much the serum which is drawn to the surface by the lymphagogic action of hypertonic saline, but particularly the more powerful defenses of the first line, the leucocytes. The superiority of normal serum to salines as a leucocytogenic agent was demonstrated many years ago, when the search for these agents was most active (*cf.* Petit[13]). In addition, serum stimulates and feeds the cells needed to bring about the repair of the wound (the second line of defense) as no other agent we possess (see Paper VI).

4. The simplicity of the technic described in Paper VI makes it evident that the application of serum could be carried out under war conditions without difficulty, even in dressing stations at the front.

THE SUPPLY.

The supply of blood serum from domestic animals slaughtered for food purposes is almost limitless. Blood is at present used for blood pudding, for the manufacture of buttons, and also for some purposes by dye manufacturers. The great mass of it, because of its nitrogen content, is used in the production of fertilizer. For all of these uses the solid portions of the blood—corpuscles and fibrin in the form of clot—are apparently the important elements. The serum, which is relatively poor in proteids, is essentially a waste product, apart from the limited amounts used for culture media and physiological experiments.

PRECAUTIONS IN ITS PREPARATION.

Serum to be used in human therapy should be passed through bacteria-proof filters, without reference to the manner of its collection.

The possible occurrence of foot and mouth disease in domestic animals, including the horse, makes the heating of serum desirable. The virus of this disease passes bacteria-proof filters,[19] but is destroyed by exposure at 50° C. for 10 minutes.[20] A temperature of 56° C. for one-half hour removes from beef serum its toxic properties for laboratory animals,[21] and does not apparently influence its therapeutic properties in man.[22] Beef serum should, therefore, be exposed to a temperature of 56° C. for at least one-half hour. Penna, Cuenca and Kraus[23] exposed the beef serum which they used in the treatment of human anthrax to 56° C. twice for one-half hour. (See Paper IV.)

CONCLUSIONS.

When to the antiseptic properties which it possesses, or provokes by its presence, we add its power to control hemorrhage, and its stimulating and nutritive qualities for the cells needed in repair, there can be little question of the desirability of the serum of slaughtered healthy food animals in the treatment of wounds. The material is abundant, and the technic of its application is simple.

REFERENCES.

[1] Zeitschrift f. Hyg., 1888, iv, 353.
[2] Centralbl. f. Bakt., v, 817; vii, 76; Arch. f. Hyg., x, 727.
[3] See Wright, Studies on Immunization. London: Constable. 1909.
[4] Am. Jour. Physiol., 1916, xl, 366.
[5] Hammarsten and Hedin. New York: Wiley. 1915.
[6] Jobling and Peterson: Jour. Exp. Med., 1914, xix, 459.
[7] La Tribune Médicale, Jan. 12, 1907.
[8] Lambert and Hanes: Jour. Exp. Med., 1911, xiv, 129.
[9] Compt. Rend. Soc. Biol., 1901, liii; Ann. de. l'Inst. Pasteur, 1904, Juin; Rev. d. Gyn. et d. Chirurg. Abd., 1904, Août.
[10] Paton: The New Serum Therapy. New York: Wood. 1907.
[11] Editorial BOSTON MEDICAL AND SURGICAL JOURNAL, Sept. 6, 1917.
[12] Brit. Med. Jour., 1915, ii, 674, 717.
[13] Les Phagocytes en Chirurgie. Paris: Masson. 1915.
[14] Jour. A. M. A., 1916, lxvi, 1753.
[15] Jour. A. M. A., 1917, lxix, 765.
[16] Wien. klin. Woch., 1915, p. 2; and Münch. med. Woch., 1914, lxi, 1967.
[17] Proc. Soc. Exper. Biol. and Med., 1916, xiii, 93.
[18] Wien. klin. Woch., 1916, xxix, 1321.
[19] Löffler and Frosch: Cent. f. Bakt. Orig., 1898, xxiii, 371.
[20] Siegel: Cent. f. Bakt. Orig., 1910, lvii, 68.
[21] Nicolle and Cesari: Jour. d. Physiol. et. d. Path. Gen., 1914, xvi, 4.
[22] See editorial, Jour. A. M. A., Sept. 30, 1917.
[23] La Prensa Medica Argentina, Dec. 30, 1916, and Feb. 10, 1917.

THE PREPARATION OF BLOOD SERUM FOR USE.

STUDIES IN SERUM THERAPY. III.

BY TIMOTHY LEARY, M.D., BOSTON,
AND
FRANK H. DUNBAR, M.D., BOSTON.

[From the Laboratories of Pathology and Bacteriology, Tufts College Medical School.]

THE most difficult problem in the preparation of blood serum is its filtration. The finer unglazed porcelain (Pasteur-Chamberland) filters may be used to produce small quantities of serum for laboratory purposes, but are so slow that they cannot be used for production on a large scale.

Diatomaceous earth (Berkefeld) filters were used in our early work. The larger Berkefeld candles are expensive, and are so worn in the necessary abrasion of the plugged outer layer in cleansing after use, that they become too thin to be depended upon after a limited use—in other words, they are short-lived. Because of the expense, it became apparent that some cheaper system of filtration, with greater capacity, should be developed.

We endeavored to produce filtration by passing serum through a prepared bed of diatomaceous earth by suction, but it was impossible to hold the filter bed intact.

Through the courtesy of Drs. A. Parker Hichens and John Reichel, of the laboratories of the H. K. Mulford Company, we were enabled to become familiar with the procedure by which they were filtering hog-cholera serum. This consisted in placing a bed of diatomaceous earth in a pressure chamber over layers of hard and soft filter paper. Air pressure above the serum drove it through the diatomaceous earth and produced filtration.

On this basis the International Instrument Company made for us a pressure filtration chamber of manganese bronze, aluminum lined. The results were good, but were not constant. The layer of earth tended to crack, or leakage occurred along the sides or beneath the layer of filter paper.

Diatomaceous earth tends to expand under steam sterilization, and when placed under pressure, or even when cooling, will crack. For over three years we have tried to overcome these difficulties, but only within the present year have we been able to obtain constantly satisfactory results.

Innumerable combinations of the various grades of diatomaceous earth have been tried to overcome cracking, and all sorts of fittings to do away with the leakage. Asbestos, which seemed ideal for filtering purposes, was discarded because of its hemolytic properties. The procedure which we use today is economical (the earth used in the bed can be washed, sterilized and re-used) and efficient.

It is necessary that the pressure within the chamber be maintained at a constant level during filtration, otherwise cracks arise. The filter bed is one inch in thickness, and a greater output is possible in a single filtration than with the thin-walled filter candles. A reservoir of serum, under the same pressure as the contents of the filtering chamber, is now in use to furnish a fresh supply as the level in the filtering chamber lowers.

TECHNIC.

Blood is obtained under what are known as food conditions, *i.e.*, the method used in collecting blood for blood pudding. The blood of sheep is collected by so-called table killing, the animal being held on a table in such a way that the blood is collected free from danger of contamination by mouth secretions or by the excreta. Beef blood is collected, after the animal has been knocked and swung, from the incision through the great vessels.

Under present methods of slaughtering, it is impossible to collect pig-blood without contamination. No pig blood is used for food purposes in this market, and we have, therefore, no experience in its use.

The blood is received in clean glass vessels (battery jars). Each vessel is immediately covered with a close-fitting aluminum cover and set aside to await the post-mortem inspection of the animal. If evidence of disease is found by the inspector from the U. S. Department of Animal Industry, the blood is discarded.

The jars containing blood from healthy animals are placed in the "cooler" of the abattoir and kept at a temperature of from 36° F. to 40° F. for from 14 to 22 hours. Ths serum is pipetted off and poured into eight-quart milk cans, in which it is transferred to the laboratory. From this time it is handled wholly in rooms set aside for this purpose. On its arrival at the laboratory, dry sterile diatomaceous earth is poured into the cans, to carry down suspended particles as it settles. The supernatant serum is pipetted or poured off as needed.

Filtration is started promptly and continued until all of the "catch" of serum is exhausted. The pressure filter chamber measures approximately 11 inches in diameter and 10 inches deep; is guarded at the bottom by a flush perforated aluminum disk; has connections for steam and compressed air; and is closed at the top by a heavy steel, gasketted cover, held by 18 bolts. The chamber is surrounded by a water jacket for cooling after sterilization.

The filter bed is made by placing in the bottom of the chamber a circular disk of heavy unbleached cotton sheeting held firmly to the bottom and sides by interlocking aluminum rings. On this is poured a suspension of a mixture of "crude" infusorial earth and a refined grade, classed as "medium" (No. 55, Howe and French, Boston), in the proportion of 250 grams of crude and 150 grams of medium. By vol-

ume the crude is about 70% of the mixture, and the medium 30%. The cover of the chamber is then bolted into place, and direct steam from the power plant is turned into the chamber, and allowed to run at 15 lbs. pressure for 20 minutes after the appearance of steam at the outlet of the filtering apparatus.

When the chamber has cooled sufficiently, a normal saline suspension of infusorial earth of the same composition as that first used (previously sterilized in the autoclave for 45 minutes at 15 lbs. pressure) is poured through an opening in the cover by means of a sterile funnel. Washing effects of this layer are prevented by a guard suspended beneath the opening through which it is poured. The purpose of this second layer is to fill in any cracks which may have been produced during the sterilization and cooling of the first layer. The combined layers make a bed about 2.5 cm. (1 inch) in thickness.

After the second layer has had time to deposit, the chamber is filled with serum. Sterile containers are connected with the outlet, and compressed air is admitted from a tank, whose pressure is about 265 lbs. The normal saline which is contained in the infusorial earth is first delivered. There is surprisingly little mixture of the saline and serum, the effluent being clear and watery until practically all of the introduced saline has escaped. Allowance is made for slight dilution of the first serum output, which is discarded.

The sterile serum is collected in gallon bottles, and from these pumped by sterile air into 20-ounce amber bottles, which are covered by a tight-fitting rubber cap, and guarded by an outer paraffin paper dust cap, which covers the neck. It is subjected in these bottles to a temperature of 56° C. for one-half hour.

While repeated tests have shown the sterility of the output as received from the filter, the further handling of the serum, although closely guarded, leads frequently to its contamination. Producers of serum for therapeutic purposes have met with this difficulty also, so that it is customary to add small quantities of antiseptics to keep down growth. Tricresol is usually added in .3% strength, but has become impossible to obtain on account of the war. The Massachusetts Antitoxin Laboratories use chloroform. We add to the serum .3% carbolic acid.

ANAPHYLACTIC REACTIONS TO NORMAL SERA.

STUDIES IN SERUM THERAPY. IV.

BY TIMOTHY LEARY, M.D., BOSTON,
FRANK H. DUNBAR, M.D., BOSTON,
AND
JOHN W. WATSON, M.D.,* BOSTON.

[From the Laboratories of Pathology and Bacteriology, Tufts College Medical School.]

ANAPHYLAXIS has been the bogie man of the serologist because of the usually fatal shock which appears in a susceptible guinea pig, following the injection of a proteid to which the animal has been sensitized, and because the term "anaphylaxis" is a misnomer.

Anaphylaxis (literally "without protection") was the term applied by Richet,[1] its discoverer, to the reaction which can be produced by injecting an antigenic (proteid) substance into an animal in a so-called sensitizing dose, and, after an interval of 8 to 14 days, introducing a second so-called toxic dose of the same proteid. In the guinea pig, death frequently follows the second dose. Autopsy discloses an over-distention of the lungs with air, due to spasm of the unstriped bronchial muscle, which throws the bronchial mucosa into folds, thus completely occluding the finer air passages. Death is due to asphyxiation by lack of exchange of air.

The secondary bronchi of the guinea pig are much more richly supplied with unstriped muscle than are those of the domestic animals or man, in whom the above described respiratory phenomena are rare.

In man, Rosenau and Anderson[2] were able to collect only 19 cases of fatal anaphylaxis, following the use of horse serum in diphtheria. The number of fatal results is so small in comparison with the number of individuals in whom diphtheria antitoxin has been used that it is difficult to estimate the percentage, which is an extremely minute fraction of one per cent.

The fatal cases in man have occurred almost wholly in individuals who were sensitized to horse proteids and most of whom suffered from asthma, presumably also arising from horse proteid sensitization. Repeated attacks of asthma, it is believed, lead to an hypertrophy of the bronchial muscle, analogous to that found naturally in the guinea pig.

In addition to the immediate general (shock) type of anaphylaxis, there may be exhibited prompt (within 24 hours) local effects at the point of inoculation, marked by edema and perhaps necrosis (Arthus phenomenon).

Delayed reactions to the injection of foreign proteids appear 8 to 14 days after the introduction of the proteid into the body, and constitute what is known as "serum sickness." The characteristic symptoms are local redness and itching at the point of injection, general urticarial rashes and, in severe cases, more extreme general reactions, joint pains, sometimes with effusion, gastrointestinal disturbances, etc.

Apart from the examples of food anaphylaxis (egg poisoning, the food urticarias and so-called indigestions) practically all of the serious effects of anaphylaxis observed in man, under treatment, have arisen from horse sensitization and have followed the use of horse serum. These effects can be prevented by the recognition that asthma may indicate horse sensitization, and by the careful administration of less than toxic doses of horse serum, where any doubt exists as to the anaphylactic state of the individual.

* Deceased.

Through the concentration of diphtheria antitoxin and the observation of the precautions mentioned above, serious accidents following the use of horse serum are practically unknown today.

The term "anaphylaxis" (without protection) is a misnomer because the condition so termed is one of increased protection. The individual is hypersusceptible because the first injection of proteid has led to the formation of antibodies, or because of a hyperpreparedness of his immunizing machinery to cope with the second injection. The result of the introduction of the second dose may be an explosive reaction due to the sudden breaking up of the foreign proteid when it meets the antibodies, or it may be, as Novy[3] expresses it, "the result of anaphylotoxin production *in corpore*, consequent upon the inducing action of a body which is formed by union, or otherwise, of antigen and its specific antibody."

Anaphylaxis due to infection is recognized in the tuberculin and mallein tests. The normal individual does not react to these tests because he has no susceptibility to the agents introduced, —in other words, he has no antibodies. The infected individual reacts because his blood contains antibodies; because he has an immunity, though perhaps of insufficient degree to overcome the infection. Specific anaphylaxis, then, is a reaction of immunity.

Until recently we have believed that the phenomena of anaphylaxis were always exhibited against specific proteid bodies, *e.g.*, that the horse-sensitized individual would react only to horse serum proteids, etc. Recent work, however, notably that of Novy and his co-workers, has indicated that other substances, even distilled water, may serve as the means of releasing the shock-producing agencies, which have arisen in sensitized animals as a result of the first dose of a specific antigen.

That anaphylaxis may be a useful reaction is indicated by the experience of Smith.[4] He treated gonorrheal complications with antigonococcic (horse) serum, and observed that improvement or cure was obtained only when an anaphylactic response occurred, and that the degree of improvement corresponded to the severity of the reaction. He was led by these observations to use normal horse serum in the treatment of a second series of cases, with results as good as those obtained with the specific serum, and concludes that whatever virtue lies in antigonococcus serum depends, not upon the antigonococcal elements, but on the horse proteids.

More or less related to the specific proteid reactions are the non-specific responses to injections of proteids, which are being used widely today in the treatment of low-grade infections, and which apparently act by stimulating the protective machinery which has been quiescent or inefficient. (See Paper II.)

In preparation for the use of animal serum in the treatment of wounds we expected to use sheep serum as our main supply. Rogers and Beebe[5] report several thousand injections of sheep serum in human beings. In 95% there followed an area of hyperemia and slight induration at the site of the injection. Occasionally the whole arm became edematous. In a large percentage of cases there was no general reaction, in spite of the fact that the serum was used in cases of exophthalmic goiter, in which nervous and cardiac unstability are marked. A few severe general reactions, coming on shortly after injections, were met with. No mention is made of the delayed reaction so familiar after horse serum. Commercial houses are now supplying sheep serum to be used for the control of hemorrhage in horse-sensitized individuals, where anaphylaxis is feared.

War conditions made the local supply of sheep serum irregular and inadequate.

We approached the use of beef serum, the main alternative, with trepidation. It was a matter of common knowledge to laboratory workers that beef serum was toxic for guinea pigs and rabbits, its injection in large doses being followed by death, and smaller doses resulting in local edema and necrosis. Nicolle and Cesari[6] have demonstrated that heating beef serum to 55° C. for one-half hour removed its toxicity.

The omnivorous human being, unlike the herbivorous guinea pig and rabbit, includes beef and beef products as constant articles of his diet, and theoretically should be in a state of constant anti-anaphylaxis with reference to beef proteids.

The literature furnished no indications, however, of the successful use of beef serum in human beings, other than by mouth (Paton).[7]

We, therefore, decided to carry out a series of skin tests on normal human beings, in order to determine human susceptibility to the local application of various animal proteids. This method seemed particularly applicable, first, because it was recognized that the toxic character of beef serum is exhibited in non-fatal doses in laboratory animals at the point of inoculation; and secondly, because in wounds the serum would be applied in most cases locally.

TECHNIC.

The early tests were made by producing a small circular abrasion of the skin with a watchmaker's screw driver. This method led to excessive traumatism of the skin in many cases. A sterile toothpick rotated between the fingers (broad end in contact with skin) tended to produce too great or too little traumatism, much depending on the edges of the toothpick and the rapidity with which the wood imbibed fluid

Satisfactory results were finally obtained by scratching the skin with the edge of a watchmaker's screw driver.

A ruler was placed against the outer side of the arm and single scratches were made outward from the edge of the ruler on alternate sides, one inch apart. This resulted in a separation of two inches between adjacent scratches on either side of the ruler. The proteid substances were applied to the scratches by means of sterile toothpicks. Aseptic precautions were used. In a few individuals with hypersensitive skins, welts (dermographia) appeared about all of the scratches. In the mass, however, the results were readable and relatively satisfactory.

The substances used in the test were:

1. Normal saline solution (control).
2. Human serum.
3. Beef serum.
4. Sheep serum.
5. Pig serum.
6. Fowl serum.
7. Rabbit serum.
8. Goat serum.
9. Horse serum.
10. Egg white (diluted 1-10).
11. Milk.

The sera and milk were fresh, undiluted and unheated. Tests were made in 113 individuals.

RESULTS.

REACTION	SLIGHT	MODERATE	MARKED
Human	2	2	0
Beef	14	17	2
Sheep	10	9	2
Pig	19	17	0
Fowl	21	25	4
Rabbit	20	15	2
Goat	16	14	2
Horse	16	15	2
Egg white	23	17	2
Milk	14	16	3

Some individuals gave skin reactions to most of the agents used, excepting the saline and human serum.

The occurrence of a reaction to human serum in a small number of cases is interesting, but agrees with the finding of isolysins in human and other sera. Although precautions were taken to make the scratches as nearly alike as possible, an error from this source, due to variation in the traumatism, cannot be excluded.

Notable is the grouping of the other sera, excepting that of the fowl. It will be observed that the reactions to beef, sheep, pig and goat sera correspond, within the limits of error, to those obtained with horse serum.

Chicken serum and egg white gave a high percentage of reactions, as would be expected from the recorded cases of egg poisoning.

In recent literature Penna, Cuenca and Kraus[8] "conclude their report of the excellent results obtained in anthrax or malignant pustule by intravenous injections of normal beef serum. At first they used prepared immune serum, but found to their surprise that normal beef serum was fully as effectual. All the fifty cases given the treatment promptly recovered. These results in the clinic corroborate the assertions of Kraus and Beltrami,[9] to the effect that normal beef serum protects rabbits against malignant pustule just as effectually as the immune sera. In the clinical cases the injection was made intramuscularly or subcutaneously in 18 cases, and the curative effect was equally pronounced. Among the typical cases described is that of a man employed in a slaughtering house to remove hides of the cattle. A small itching pimple developed on the left wrist, which rapidly spread, and in five days had become transformed into a malignant pustule, the arm swollen, with high fever and pulse of 130. He was given two subcutaneous injections of beef serum, a total of 60 cc., the fifth and sixth days, and improvement was evident in two days. By the thirteenth day he had quite recovered, except that the glands in the axilla were still enlarged. The anthrax bacillus was cultivated from the vesicles." (Review; *Jour. Amer. Med. Assn.*) The *Journal of the American Medical Association* comments editorially[10] on a later, evidently unpublished, report of the treatment of 90 additional cases, with one death. The normal beef serum used was heated to 56° C. twice for one-half hour. No anaphylactic reaction appeared save slight local swelling in two cases.

Dr. Edwin Place, physician in chief, South Department, Boston City Hospital, in a personal communication of unpublished work, states that in preparation for the use of antitoxin in individuals who were known to be hypersusceptible to horse serum, he carried out a series of injections (1 to 10 cc. in arm or back) of antitoxic beef serum in over one hundred cases.

Practically 90% of the cases exhibited a local reaction marked by the appearance within 24 hours of redness, swelling and tenderness about the site of the injection. This, though oftentimes extensive, subsided in all cases without local after-effects in two or three days. None of the children exhibited any other anaphylactic reaction, *i.e.*, the reaction was purely local, in no case becoming generalized. This is in contrast to the reaction to horse serum, which, when it occurs, is usually delayed and general, marked by urticarias, etc.; rarely is there exhibited a purely local reaction. The antitoxic effect, as was to be expected, corresponded to the effect of using antidiphtherial horse serum.

CONCLUSIONS.

The results of our observations indicate that the skin reactions to unheated beef serum correspond closely to the reactions obtained with the sera of the other higher domestic herbivora, including the horse.

The work of Dr. Place justifies a belief that beef serum, unheated, has only minor local toxicity, if any, in human beings, and can be used from this standpoint almost as safely as can horse serum. The observations of Dr. Place indicate that beef serum is safer than horse serum with reference to delayed anaphylactic responses, which follow so frequently the use of horse serum.

The clinical application of beef serum in the treatment of wounds has been followed by no anaphylactic phenomena when the serum has been applied to wound surfaces.

In six cases injections of serum were made, either subcutaneously or into the deep tissue. The amount injected was about 15 cc. In three of these cases chills occurred within two hours of the injection. In only one case was the chill marked, the temperature reaching 103.

In no case did a delayed anaphylactic reaction appear.

REFERENCES.

[1] Compt. Rend. Soc. Biol., Paris, 1902.
[2] Preventive Medicine, etc., Rosenau, New York, 1913.
[3] Novy and DeKruif: Jour. Inf. Dis., xx, 6, June, 1917.
[4] Jour. A. M. A., June 8, 1916, p. 1758.
[5] Arch. Int. Med., 1908, ii, 297.
[6] Jour. de Phys. et de Path. Gen., xvi, 4, 1914.
[7] Paton: New Serum Therapy. Wood: New York. 1906.
[8] Prensa Medica Argentina, Mar. 10, 1917, reviewed in Jour. A. M. A., 1917, 1589.
[9] Prensa Medica Argentina, 1916-17, iii, 225.
[10] Jour. A. M. A., Sept. 30, 1917.

A CASE OF STREPTOCOCCUS MENINGITIS SUCCESSFULLY TREATED WITH NORMAL (HUMAN) SERUM.

STUDIES IN SERUM THERAPY. V.

BY FRANCIS P. MCCARTHY, M.D., BOSTON.

[From the Pathological Laboratory and Medical Service of St. Elizabeth's Hospital.]

THE following case is reported because it is the first case of streptococcus meningitis treated by a normal serum, and because of the rarity of records of the successful outcome of any form of treatment in this condition.

A search of the literature discloses 9 reported cases of recovery in which streptococci were found in the lumbar puncture fluid.

Alexander[1] reports meningeal infection, due to middle ear disease, in a case which recovered following opening of the vestibule, incision of the dura and drainage.

Netter[2] reports recovery in meningitis secondary to double otitis media in a child. The treatment in this case included spinal puncture, warm baths and the intravenous injection of collargol.

Tedesco[3] reports a case with undisclosed origin, which recovered following repeated lumbar punctures.

Du Bois and Neal[4] report recovery in meningitis secondary to otitis media. Treatment consisted in intraspinal and intravenous injection of antistreptococcus serum.

Bryant[5] treated a case, following otitis media, by decompression and local drainage, with the internal use of magnesium sulphate, to combat the toxemia. Death occurred on the 190th day after operation, from infection of the operation wound and encephalitis.

Day[6] reports a meningitis (following mastoiditis) successfully treated by intraspinal use of antistreptococcus serum and an autogenous vaccine subcutaneously.

Leighton and Pringle[7] report the recovery of two cases following otitis media. The treatment consisted in lumbar laminectomy and drainage.

MacKenzie[8] treated successfully a case, following mastoiditis, by incision and drainage of the dura.

The following case was turned over to me for treatment by Dr. Felix McGirr, in whose service it occurred.

A. J. Male, age 25 years, brakeman.

Past History. Patient had an accident while working on railroad July 15, 1916. His head was struck by a bridge and he was rendered unconscious. He was treated at St. Vincent's Hospital, Worcester, Mass., for scalp wound and questionable fracture of skull. He recovered in two weeks, and returned to work in good condition at the end of six weeks.

Present Illness. Oct. 14, 1916. Patient was caught between two freight cars and suffered injuries to his head and chest. He was brought to St. Elizabeth's Hospital unconscious and bleeding from both nares. He recovered consciousness a few hours after entrance, but suffered from shock. The next day he complained of severe frontal headache, dizziness and nausea. Ten days later he complained of pain in the right ear. Examination by Dr. Edgar M. Holmes, showed hearing absent in right ear, bloody crusts in both nares, especially on right side. Interpretation of findings suggests injury extending from ethmoid (cribriform plate) to middle fossa.

Nov. 7, 1916. Patient out of bed, unsteady, rather dizzy.

Nov. 18. Discharged, relieved, returned home. Patient reported at Out-Patient Department for deafness in right ear.

Dec. 14. Patient taken with severe chill and went to bed. A few hours later was found by a member of his family on the floor under the bed, delirious and very difficult to manage. It was necessary to administer ether to the patient in order to get him into the ambulance. Patient actively delirious on entrance, rational only for a few minutes at a time, and complained of severe headache. Temperature, 103.5, pulse 140. Physical examination showed marked rigidity of neck, nystagmus, hyperesthesia, knee jerks very lively, double Kernigs. Cremasteric reflexes exaggerated.

Dec. 15. Patient very delirious. Ether was necessary in order to perform lumbar puncture. 80 cc. of purulent fluid escaped under pressure. 20 cc. of normal human serum injected into spinal canal.

Bacteriological examination shows Gram positive diplococci in short chains on smears. Cultures on blood agar show a non-hemolytic organism, whose colonies have a slight greenish tinge. Inulin is not

fermented. The organism is, therefore, to be classified as a streptococcus viridans.

Dec. 16. Lumbar puncture, cocaine anesthesia. 15 cc. of spinal fluid escaped under considerable pressure. 15 cc. human serum introduced. Fluid clearer, though still very cloudy, with a slightly yellowish tinge. Smears show polymorphonuclear leucocytes and abundant streptococci. Cultures same as on previous day.

Dec. 17. Lumbar puncture. 40 cc. of purulent fluid escaped under moderate pressure. The fluid was less cloudy. 15 cc. of normal human serum (obtained from the patient's brother) was introduced into the spinal canal.

Dec. 18. Lumbar puncture. 25 cc. of fluid escaped under slight pressure. 15 cc. of normal human serum injected into canal. Patient shows daily improvement and is now rational, but headache persists.

Dec. 19. Lumbar puncture. 30 cc. of cloudy fluid under pressure. 10 cc. of human serum injected. Very few streptococci found in smears.

Dec. 20. Lumbar puncture. 35 cc. of slightly cloudy fluid obtained under slight pressure. 15 cc. of human serum introduced into canal. Patient is now quite normal, taking interest in current events, able to read newspapers.

Dec. 22. Lumbar puncture. 12 cc. of almost clear fluid obtained, no pressure. 10 cc. of human serum introduced. Fluid shows fewer leucocytes on smears and no streptococci. Cultures negative. Temperature has shown a gradual drop to normal.

Jan. 2, 1917. Patient very comfortable, rigidity of neck absent. Kernig present slightly on left, absent on the right. Knee-jerks still exaggerated.

Jan. 12. Patient out of bed, somewhat unsteady, with slightly spastic gait.

Jan. 17. Walking much improved, spasticity disappeared.

Feb. 2. Patient has improved in general health and is now in normal condition, except for deafness in right ear which resulted from the first injury, and antedated the attack of meningitis. Patient discharged from hospital today.

Patient shows no sequelae since discharge from hospital up to date.

The normal blood serum, with the exception of that used in one injection, was obtained from the Obstetrical Department of the Hospital by collection from umbilical cords, under aseptic precautions. This serum was controlled by Wassermann and bacteriological tests before use.

It is our custom to conserve placental blood, which is collected as a routine. The serum is separated, and stored in the Pathological Laboratory for use in hemorrhagic conditions.

REFERENCES.

[1] Alexander: Arch. f. Ohrenheilk., 1908, lxxvi, 1.
[2] Bull. et Mem. Soc. Méd. d. Hôp., 1909, xxvii, 11.
[3] Zentralbl. f. Ohrenheilk., 1910-11, ix, 365.
[4] Archives of Pediatrics, 1915, xxxii, 1.
[5] BOSTON MEDICAL AND SURGICAL JOURNAL, 1914, clxxi, 803.
[6] Surg., Gyn. and Obst., 1913, xvi, 369.
[7] Jour. A. M. A., 1915, lxiv, 2054.
[8] Proc. Roy. Soc. Med., London, 1915, viii, Otol. Sect. 57.

THE TREATMENT OF WOUNDS WITH NORMAL (BEEF) SERUM.

STUDIES IN SERUM THERAPY. VI.

BY JOSEPH H. SHORTELL, M.D., BOSTON,
WILLIAM F. COTTING, M.D., BOSTON,
AND
TIMOTHY LEARY, M.D., BOSTON.

[From the Surgical Services of the Boston City Hospital, and the Laboratories of Pathology and Bacteriology, Tufts College Medical School.]

INVESTIGATION of the value of normal serum treatment of wounds cannot be carried out successfully in animals, because laboratory animals are refractory to infection with the pus-producing bacteria which are active in human beings. Lignieres[1] produced local ulcerations of the thigh in guinea pigs by the injection of attenuated anthrax cultures. These ulcers healed spontaneously, although after considerable delay. Treated with normal horse serum, healing occurred more rapidly than in untreated controls.

The conditions produced by attenuated anthrax cultures are, however, not wholly comparable to the septic wounds which arise in human beings as the result of the activity of the pus producers. Conclusions as to the efficacy of any agent in the treatment of septic wounds must depend, in the last analysis, on the actual treatment of wounds in human beings.

In the application of normal serum to the treatment of wounds, the following technic has been practised:

TECHNIC.

Essential principles in the treatment of open processes with serum are:

1. That when the dressing (gauze soaked with serum) is applied, it should touch every part of the wound, and should be packed into blind pockets with dressing forceps.
2. That the dressing should be kept moist.

For general purposes, dressings of sterile gauze soaked with serum and then placed in contact with the wound, have been applied at four-hour intervals in cases showing large surfaces.

A method which is responsible for greater economy of serum and gauze, and equally successful, consists in moistening the gauze with serum at intervals without changing the dressing. For this purpose an atomizing nozzle attached to the serum bottle has been used.

Where a cavity is present, serum may be poured into the dressing, which is then changed only twice a day. The cavity is irrigated with serum by means of a P syringe, whenever the dressing is changed. Deep sinuses, where intimate contact of the dressing with all parts of the surface is impossible, should be irrigated at more frequent intervals (three hours). In cases of diffuse cellulitis, with through-and-through openings, irrigation is practiced by means of a

P syringe into the rubber tissue or tubing used in the dressing.

In the treatment of burns, dressings are moistened *in situ*, and changed only once a day.

Fresh wounds are cleansed, irrigated with serum, sutured where it is possible to approximate the skin edges, and a serum dressing applied externally. This dressing is not disturbed for three or four days, unless evidences of sepsis appear. Where the edges of the wound cannot be approximated, a serum dressing is applied, kept moistened with serum, and not disturbed until the end of five days, when the wound surface will be found covered with clean granulations.

In compound fractures the skin is cleansed in the usual manner with soap and water, followed by alcohol. If the bone projects, it is cleansed with soap and water, followed by saline, and reduction practised. The wound is irrigated with serum and closed. The serum which remains in the cavity before suturing is not dislodged.

Injections into the deep tissues by means of a Record or Luer syringe, have been practiced in six cases of diffuse cellulitis, where drainage was inefficient, through the multiple openings made. Ten to twenty cc. of serum are introduced into the brawny tissue showing inflammatory edema.

For the prevention of evaporation, dressings with large surfaces may be covered with oiled paper. For the technic of skin grafting, *vide infra.*

The following cases* have been treated:

(The numbers in brackets have been assigned to the cases in our serum records. Op. indicates operation. S.P.A. indicates Staphylococcus Pyogenes Aureus. Flaxseed and chlorinated soda indicate the use of flaxseed poultices, interrupted by 15-minute soaks in hot chlorinated soda solution every four hours. Irrigation refers to serum irrigation. O.P.D. indicates Out-Patient Department. The time of healing or of healthy granulation is recorded with reference to the beginning of treatment with serum.)

A. CELLULITIS.

1. (1) Male, 28. Peri-rectal abscess, dissecting from anus to scrotum, with large sloughing scrotum and several openings. Op., large incisions from anus through scrotum. Under chlorinated soda dressings, scrotum continued to slough. Serum dressings followed by prompt disappearance of sepsis, with granulation in 5 days.

2. (3) Male, 52. Carbuncle of neck, 3 inches in diameter. Op., excision. Clean granulations in five days under serum dressings.

3. (6) Male, 44. Gangrenous scrotum. Op., incisions. Under serum dressings sloughs separated, including a large part of scrotum, and healthy granulations filled in area in five days. Five days later, plastic operation followed by serum dressings. Healed by first intention.

4. (10) Male, 40. Ischio-rectal abscess (left). Op., incision, drainage. Cavity packed with gauze soaked with serum. Irrigations. End of fourth day, cavity filling in with granulations, no pus.

5. (12) Male, 38. Carbuncle of neck, five inches in diameter. Op., excision, packed with iodoform gauze. Next day serum dressings. Discharged on fifth day with healthy granulations. (See also under skin grafting No. 61.)

6. (14) Male, 58. Diabetic. Carbuncle of back. Op., incision and drainage in O.P.D. Admitted to House because of extension. Op., incision enlarged, curetted. Serum pack. Three days later sepsis cleared up, wound strapped.

7. (22) Male, 44. Diabetic. Carbuncle of back. Op., incision in O.P.D. Admitted to House because of extension. Op., excision, followed by alcohol dressing. Dichloramin T dressing for two days. Flow of pus from wound. Serum dressing followed by clean wound in 3 days. Healthy granulations, seven days after operation.

8. (25) Male, 38. Abscess of scrotum (localized, S.P.A. infection). Op., incision, 4 oz. pus. Serum irrigation and dressings every 24 hours. Two days later, slight amount of clear fluid. Discharged to O.P.D.

9. (28) Male, 28. Cellulitis of scrotum. Flaxseed poultices for six days. Op., incision. Serum irrigation and dressing. Slight discharge of pus. Fourth day, clean granulations appearing, edema subsiding. Eighth day edema absent, abundant granulations.

10. (36) Male, 48. Pulmonary T.B. Cellulitis from left knee over leg to mid point. Op., small incision. Eighteen days later, little better under flaxseed and chlorinated soda. Op., opening of abscess cavity by two small incisions, above and below. Rubber tube drainage. Through-and-through serum irrigation. Fourth day pus discharging freely, swelling subsiding. End of two weeks, swelling gone, slight discharge. Eighteen days clean. Discharged to Consumptives' Hospital.

11. (46) Female, 28. Cellulitis of leg five days after wound of knee. Periarticular swelling of knee with femoral glands. T., 102. Flaxseed two days, with extension of process. Op., incision, through-and-through drainage (rubber tube). Serum drip every two hours for one-half hour. Twenty-four hours later, copious pus. Three days later swelling gone, very little pus. Irrigations discontinued. Discharged on seventh day to O.P.D.

12. (81) Male, 8. Ischio-rectal abscess. Op., incision. Abscess three and one-half inches deep. Serum irrigation and wick to depths. Twelve days later clean, filled with granulations.

13. (27) Male, 49. Septic ankle 5 days following sprain. Ten days later op., incision, 4 oz. pus (S.P.A.). Under serum irrigation and dressing, local process cleared incompletely in 8 days, when he showed positive blood culture. Developed pyemia, and died twenty-first day after injury.

B. INFECTED WOUNDS.

14. (4) Female, 6. Crush of foot by street car. Op., Lisfranc amputation, flaps poor. Eight days later flaps sloughing, stitches removed. Serum irrigation and dressing. Five days later flaps still sloughing. Eleven days later clean granulations. (See also skin graft No. 58.)

15. (5) Male, 16 mos. Double undescended testicle. Op., wounds septic, four days later all stitches out. Serum irrigation and dressing. Four

* Acknowledgment is made to the members of the Surgical Staff of the Boston City Hospital, in whose services these cases have been treated. Thanks are also extended to the House Officers for their coöperation.

days later wounds granulating. Healed on eleventh day.

16. (9) Male, 35. Septic scalp wound, six inches long, six days after injury, periosteum denuded. Side of head swollen and tense with pus. Stitches removed. Serum dressings. Covered with clean granulations in four days.

17. (11) Male, 13. Persistent urachus with cystitis. Op., suprapubic cystotomy. Developed sepsis of wound. Abundant pus. Serum dressings begun 12 days after operation. Pus increased in 24 hours. Sepsis clear in 48 hours. Healed in eight days.

18. (16) Male, 14. Lacerated wound of leg with avulsion of skin (crush). Four days later, slough of flap with sepsis. Four days later, flap removed. Serum dressings begun. Four days later, wound clean, granulating.

19. (17) Male, 54. Inguinal hernia, scrotal abscess. Op., hernia incision. Finger in scrotum disclosed abscess of scrotum. Through-and-through incision. Reduction of hernia abandoned. Under treatment with Dakin's solution 13 days, with little relief. Very profuse discharge from upper wound. From lower wound, discharge fecal in color and odor. Through-and-through serum irrigations and dressings begun. After seven days, induration gone, upper wound clean, slight discharge from lower wound. Wounds healed in nineteen days.

20. (18) Male, 51. Osteomyelitis of finger with septic hand, following blow. Flaxseed and chlorinated soda for 10 days. Op., amputation of finger. Culture, pneumococcus and B. coli. Four days later, open flaps sloughing. On seventh day serum begun, injection about wounds (10 cc.) with dressing. Eighth day after, wound clean, granulating.

21. (30) Male, 45. Traumatic rupture of gall-bladder. Op., repair, with drainage. Sepsis of abdominal wound. Ten days after op. serum irrigations begun. Eight days later wound clean.

22. (35) Female, 18. Septic finger. Op., amputation. Flaps not sutured. Serum dressings. In six days, clean granulations. Discharged O.P.D.

23. (39) Female, 22. Acute appendix. Op., excision with drainage. Twenty days later, persistent sinus with abundant pus. Serum irrigations begun. Six days later, discharge ceased. Wound strapped.

24. (49) Male, 17. Septic lacerated wound of scrotum 5 days after suture. Stitches removed. Serum dressings. Wound clean in two days.

25. (57) Male, 23. Ruptured appendix. Op., excision, 11 days later dissecting sepsis under skin and muscle, wound gaping. Serum irrigation and dressings. Six days later, wound clean, strapped unsuccessfully. Secondary suture on tenth day. Reinfection of wound, seventeenth day. Wound gaped. Serum treatment again started. Six days later, wound clean, strapped. On twelfth day, wound healed solid. (In this case the second strapping was carried out in such manner that serum dressing could make contact through the lacing.)

27. (64) Female, 39. Appendectomy, persistent draining sinus when discharged. Readmitted in four months with chronic abscess of abdominal wall. Op., incision. Serum dressings for two weeks, still draining, though diminished quantity. Chlorinated soda dressings.

28. (67) Female, 26. Foreign body in finger. Op., removal of needle, followed by sepsis in finger and hand. Op., incisions. Flaxseed and chlorinated soda. Serum injection (12 cc.) four days later, followed by dressing. Sepsis in hand cleared up in four days. Finger swollen. X-ray showed osteomyelitis. Refuesd operation and left hospital.

29. (71) Male, 10 months. Mastoid operation. Septic glands of neck, incised. Developed measles. Incision from mastoid over back of neck. Treated with chlorinated soda without success. Four weeks later, serum dressings to foul wound with indolent granulations. In four days, wound clean and almost healed.

30. (72) Female, 12. Finger lacerated by firecracker. Op., amputation. After several days, stump septic with extension to palm. Four months later, septic stump with old granulations discharging pus, and septic wound of palm. Under serum, granulations healthy in 5 days. No pus.

31. (77) Male, 45. Hernia operation, followed by sepsis in four days. Serum dressings. Fourteen days later, wound clean, practically healed.

32. (26) Male, 53. Varicose veins. Op., followed by sepsis in four days along stripper track. Streptococcus and S.P.A. Serum irrigation and dressing. Four days later, track clean. On eighth day, secondary suture of wounds followed by sloughing of stitches, which cleaned up in two days.

32A. (55) Male, 52. Stab wound of abdomen with stick, perforating. Op., exploratory, drainage. No perforation of gut found. Three days, fecal fistula. Serum dressings. In two days, fecal discharge stopped. Slight sero-purulent discharge for 48 hours longer. After 8 days, wound strapped. Healing by first intention.

COMMENT.

Striking, in the treatment of septic conditions, is the rapid control of the sepsis. Wounds once cleared of their sepsis, remain clean under serum applications. Granulations appear earlier than under other forms of treatment and grow with great rapidity. Granulations are recognized as important agencies in the protection of wound surfaces. Their early appearance and rapid spread may account in part for the permanence of the control of sepsis under serum.

The comfortable feeling which patients report after wounds are dressed with serum, and the complete absence of any sensation of irritation, are worthy of comment.

Case 13 died of pyemia, evidently due to bacterial invasion of veins below the wound surface and beyond the possibility of contact with the wound dressings.

In Case 27 no explanation can be offered of the failure of serum, as well as other agents, to control the sepsis. A Wassermann was negative.

C. ACUTE OSTEOMYELITIS.

33. (15) Female, 9. Right tibia S.P.A. Op., trephine, trough produced by removal of necrotic marrow. Wound sutured at ends, filled with gauze soaked with serum. Irrigation twice per day. Purulent discharge slight. Eight days later discharge only from marrow at ends of cavity. Soft tissues have escaped infection. Granulation began in seven days in soft tissues. Fifteen days, abundant granulations. Twenty-three days, backing up of pus in marrow cavities at ends. T., 103. Serum

injected into marrow tissue. Temperature terminated by lysis in two days. In 30 days, cavity filled with granulations. Three small pieces of necrotic bone removed. In five weeks, exuberant granulations cauterized. Discharged O.P.D. in six weeks, with small granulating surface.

34. (33) Male, 12. Right tibia. Op., trephine, cavity cleared out, filled with serum. Wicks placed, skin partly sutured. In six days, granulations starting, very small amount of pus. In twenty days, up and about. In twenty-three days discharged to O.P.D. Wound filled with granulation and healing.

35. (60) Male, 49. Tibia. (S.P. Albus, Aureus, diphtheroid bacillus). Op., trephine, trough made, iodoform pack. Two days later serum pack. Ten days later bone covered with granulations. Little discharge except from lower pocket. Fifteen days later X-ray showed pocket beyond operation field. Op., extension two to three inches, pocket cleared out, iodoform pack. Eight days after second op. new wound granulating. Twenty-one days later ready for grafting.

COMMENT.

Under serum, these cases showed much less purulent discharge, and granulations appeared earlier and in greater abundance than under any other form of treatment. The filling of the cavity with granulations, which did away with the cavity as such, earlier than is usual in the average case, converted bed into ambulatory cases, and was an important factor in shortening the stay of patients in the hospital.

D. COMPOUND FRACTURES (SEPTIC).

36 (19) Male, 42. Both bones, forearm. Op., cleansing and reduction. One week later sepsis. Two-inch wound opened, four oz. pus. *Bone showing.* Serum irrigation and pack. Four days later no discharge. Wound granulating. On seventh day granulations filled wounds, all symptoms subsided. Discharged O.P.D.

37 (37) Male, 35. Clavicle (simple fracture). Did not return for treatment until two weeks when septic compound fracture appeared. Alcohol cleansing, iodoform pack. Dakin's for four days, much pus. Serum dressing started. Eight days later slight discharge. *Granulations covered over bone.* Twelve days later wound clean. Discharged to O.P.D.

38 (45), Male, 17. Both bones of leg. Culture S.P.A. Albus B. Coli, Diphtheroids. Op, cleaned and repaired. Three days later septic, seven days later much pus. Hypodermic injection serum 20 c.c. Five days later three injections into tissue, slight general reaction after each. Tenth day, serum irrigation and dressing. Pus from cavity, bare bone. Twenty-two days later granulations, slight discharge. *Bared bone (one-half inch at end) covered in with granulations and did not exfoliate.* Thirty-two days, clean. Forty-three days, healed.

39. (47) Male, 36. Both bones of leg (14 mos.) S.P.A. Three op. since. Old sinuses. Serum injections into walls for four days. Reaction in three hours. T. 100, with chills. Serum irrigation. Thirty-four days later one sinus healed, other discharging pus. Op., fragment of dead bone one inch in greatest diameter removed. Healed under Carrel-Dakin.

40. (48) Male, 33. Both bones of leg. Op., cleaned and repaired. Healed. Three and one-half weeks later open reduction and wiring for position. Twenty-five days after op. sepsis. Twenty c.c. serum injected into tissue. Moderate chill. Temperature 99. Serum dressings. Nine days later wound clean. Thirteen days healed.

41. (69) Female, 24. Both bones of forearm. Op., cleansed and repaired. Three days later sepsis. Seventh day serum started. Four days later serum dressings changed to Dakin's. Clean in seven days. Granulation.

COMMENT.

In Case 38, naked bone covered in with granulations and did not exfoliate. In Cases 36 and 37, the periosteum covering exposed bone was quickly covered in by granulations spreading from the soft parts. In none of these three cases did an osteomyelitis follow. The latter three cases had already established osteomyelitis when they came under treatment. In Case 39 the failure of serum to clear up the process is explained by the finding of a sequestrum, the removal of which was followed by healing under another agent.

In Case 41, the use of serum was stopped, we believe, without good reason. It is possible that the leucocytogenic reaction, which is frequently marked under the use of serum, may have influenced the change of treatment. (It should be remembered that the control, in all of the cases reported, remained in the Surgical Services to which patients were assigned.)

E. SEPTIC ULCERS.

42. (13) Male, 65. Extensive septic ulcers of leg. Eight years. Streptococcus, B. Coli. Serum dressings. Clean granulations in four days. Fourteen days ready for graft.

43. (40) Female, 66. Recurring varicose ulcers, ten years (septic). Serum dressings. In five days healthy granulations.

44. (61) Male, 42. Crush of leg 10 years ago, followed by extensive septic ulcer (S.P.A. Albus, B. Coli, Diphtheroid). Thirteen days later clean, healthy granulations.

45. (62) Male, 34. Varicose ulcers, septic. Serum dressings. Twelve days no discharge. Grafted. (See Graft No. 68.)

COMMENT.

Sepsis cleared rapidly, and old, indolent granulations became active, clean granulations in a very short time.

F. BURNS.

46. (30) Male, 10. First, second and third degree burns. Picric acid. Ambrine four days. Sepsis. Serum dressings. Four days clean. Eight days covered with granulations. Patient refuses graft.

47. (34) Male, 33. Burns of second degree. Treated at home two days with boric ointment. Mild sepsis. Serum dressings. Four days later clean. Seven days later graft done. (See graft No. 64.)

COMMENT.

Both of these cases became septic under other treatment, and responded promptly to serum medication.

G. FRESH WOUNDS AND COMPOUND FRACTURES.

The conditions which are found in fresh wounds furnish the closest approximation we can obtain to war wounds. Their treatment should supply data as to the value of serum in prophylaxis.

48. (2) Male, 40. Compound clavicle. Op., wound packed for hemorrhage. Second day serum dressing. Ten days later filled with granulations. Fourteen days healed.

49. (7) Male, 56. Extensive laceration of leg. On account of shock, wound left open. Dirt removed. Serum dressing. Following day loose suture. Four days later death from shock and alcohol. Wound found absolutely clean.

50. (8) Male, 17. Crush of hand with lacerations. Op., wounds cleansed. Serum irrigations, suture. Serum dressing. No blood supply to distal phalanx. Two days later amputation of phalanx. Four days clean. No sign of sepsis at any time.

51. (20) Male, 40. Compound femur. Fracture of both bones of leg. Shock. Serum injection into wound. Dressing. Ten days later wound healed. Fourteen days later death from delirium tremens. No sepsis at any time.

52. (21) Male, 22. Crush and laceration of three fingers. Fingers partially torn off. Op., cleansed. Removal of nails. Serum injections. Wounds sutured. Five days later healing by first intention.

53. (50) Male, 32. Alcoholic, jumped from window, producing compound fractures of both femora and supracondylar fracture of humerus. In marked shock. Elbow wound dirty, oozing abundantly (question of rupture of capsule of elbow joint). Rapid (emergency) cleansing of skin with soap and water and alcohol. Serum injected into wounds, which were sutured. In bed with all apparatus on in twenty minutes. Eight days later wounds healed. No evidence of sepsis at any time.

54. (59) Male, 19. Compound fracture of humerus by bullet. X-ray shows bullet in several flattened fragments. Wound cleansed. Serum injected in wound following day. In seven days wound practically healed. No evidence of sepsis at any time. Discharged O.P.D. to return for removal of lead.

55. (74) Male, 45. Crush of fingers. Op., amputation of fingers. Large open surface left on back of hand. Serum dressing. Five days later granulations. In ten days skin graft.

56. (38) Male, 33. Avulsion of skin of fingers two inches by half inch. Serum dressings. Five days later granulations. Ten days later area closing in. No sepsis.

57. (54) Male, 17. Amputation, tip of finger. Serum dressings. Five days later granulations. Fourteen days practically closed. No sepsis.

COMMENT.

In all cases of fresh wounds treated with serum from the start, healing has been without evidence of sepsis.

(Several cases of sinuses, following appendectomy with drainage, and other minor forms of surgical sepsis, have been successfully treated. The results, although prompt, have not appeared significant enough in these minor processes to justify detailed description.)

TECHNIC OF SKIN GRAFTING.

If granulations are septic they should be treated for one or two days with serum dressings. With clean granulations no preparation is necessary. Exuberant granulations, if present, should be removed. Grafts are obtained by the usual methods and placed in the usual manner. Perforated compress cloth is then placed over grafted area and fastened in place by smearing collodion at margin. Sterile gauze (3 or 4 layers) soaked in serum, is then applied over this and held in place by a light bandage. Serum is then poured, or better, sprayed, through an atomizing nozzle, over the dressing, often enough to keep the grafts moist, which is about once in four hours. Dressing may be removed on the fourth or fifth day, and the surface exposed to the air for one-half hour. If, after the sixth day, there is evidence of the granulations becoming exuberant, an ambrine dressing should be substituted.

H. SKIN GRAFTS.

58. (4) Female, 6. Granulating stump. Reverdin graft. Serum dressings. Five days all grafts taking. No pus. Eleven days healed.

59. (12) Male, 38. Granulating wound following excision of carbuncle. Hairs pulled from head, roots cut off and scattered over wound. Serum dressing. In eight days small white pin-point areas seen. In twenty days, one-half of area of wound covered in with new epithelium from grafts. (A criticism of the treatment in this case is that an insufficient number of hairs was planted. The epithelial islands, which arise from the epithelium attached to each hair root, are so small that close planting should be practised in order to expedite healing.)

60. (23) Male, 5. Large granulating area following burns. Reverdin grafts. Three days, no pus. All grafts in place. Seven days all grafts growing.

61. (32) Male, 39. Granulating area following septic process, four by three inches. Point grafts. Serum. Four days, grafts in place. Eight days, grafts spreading.

62. (34) Male, 32. Granulating area following burns. Point grafts. Serum. Five days, all in place. Eight days, spreading.

63. (65) Male, 38. Large granulating area following burns. Reverdin and Thiersch grafts. Serum. Four days, all in place. Eight days, spreading. Twelve days, exuberant granulations covering in grafts.

64. (68) Male, 5. Large granulating area following septic lacerated wound of leg. Point grafts. Serum. Four days, grafts taken. Eight days, spreading.

65. (61) Male, 42. Extensive granulating ulcers covering both lower legs. Reverdin graft. Serum four days. One-half of grafts successful. Eight days, spreading. Another graft to be performed.

66. (62) Male, 34. Chronic varicose ulcers of leg (six years). Point grafts planted on old granulations. Four days, one-half of grafts successful. Fourteen days, ulcers practically healed over.

67. (41) Female, 23. Large granulating area following extensive laceration of leg with septic compound fracture of both bones. Grafted (pin-point) while area was still bathed in pus from fracture. Four days later all grafts in place. On tenth day dressing was permitted to dry. Grafts all black. Dressings kept moist and on twelfth day grafts all in place, healthy and spreading.

68. (40) Female, 66. Old varicose ulcer (10 years). Reverdin grafts, serum. Four days, only few grafts have taken. Eight days, spreading.

COMMENT.

In ordinary methods of grafting, the surface is covered with a puriform discharge for several days. In grafts under serum this discharge does not ordinarily appear, the granulations remaining clean and rosy. Apart from the chronic ulcers, where the percentage of grafts which take is always problematical, striking has been the high percentage of takes. The success of the hair graft in Case 59 demonstrates so conclusively the value of serum in controlling the sepsis and supplying nutrition to the growing epithelium, that no comment is necessary.

In Case 63, although all of the grafts took, they were allowed to become buried in exuberant granulations. Serum is a more active stimulant of granulation than any agent we possess. Its use should probably have been stopped on the seventh or eighth day in this case, and a less stimulating dressing, such as an ointment or an ambrine dressing, used.

In Case 68, grafts were placed on an old varicose ulcer after several days' preparation by serum. Failure to succeed in this case is thought by the house officer to have been due to excessive thickness of the grafts. Another possible explanation lies in the dense scar tissue of the base of the ulcer, which was not removed, and through which all of the vessels to the granulating surface had to pass.

I. FINGER-END GRAFT.

69. (73) Male, 35. Traumatic amputation (complete), through middle of terminal phalanx including bone and whole of nail. After removal of nail, finger sutured in place one-half hour after amputation. Serum dressing. Five days later slight sloughing of wound edge. Slough removed. At end of ten days site of slough granulating. Firm union of soft parts. Restitution almost perfect. (The interesting point in this case was not so much the restitution of the finger, but the fact that even though there was not enough circulation to prevent a partial necrosis, the process of sloughing was, and remained, sharply limited without suggestion of sepsis.)

CONCLUSION.

The results in these cases speak for themselves. Certain conclusions are justified:

1. Serum will control a septic process, wherever contact is made between the serum dressing and the infected tissue.
2. It is absolutely harmless to normal tissue.
3. As a prophylactic agent in fresh wounds it is of value.
4. Serum is a most marked stimulant of granulations. We believe that grafting can and should be practiced earlier following the use of serum than under any other agent.
5. Injections of unheated beef serum are followed by rises in temperature, usually slight, perhaps with chill, but the reactions are short and not severe. Used as a dressing to wounds, no matter how large the surfaces are, it gives rise to no anaphylactic response.

REFERENCE.

[1] Bull. de l'Acad. de Méd., 1915, xxiv, 522.

PHYSICAL EXAMINATION OF FACTORY EMPLOYEES: TWO THOUSAND CONSECUTIVE CASES AND THE DEFECTS FOUND.

BY RAYMOND W. CUTLER, M.D., WORCESTER, MASS.

THE following defects, discovered during the routine examination of applicants for positions at the Norton Company, may be of interest as a general index to the physical condition of the average workman in this country. A large proportion were of American birth, but among the two thousand examinations from which the defects are shown nearly every nationality was represented. The positions applied for represented all grades of occupations, from common day laborers to skilled machinist and office workers. The physical examination in nearly every case was made before the man was formally engaged. Although many defects were noted and recorded, only 84 men, or about 2 1/3%, were found with defects severe enough to warrant non-approval. This percentage was further reduced when those cases temporarily non-approved returned after having their defects corrected. In order to show the methods used at this factory when examining an applicant, a brief description of a routine examination will be given.

ORDER OF EXAMINATION.

The man, who has been previously interviewed by a member of the employment department in regard to his ability to fill the position, is turned over to a male nurse in attendance at the examination rooms and conducted to one of a series of dressing-booths which separate the examination rooms from the employment department. He is requested to remove his clothing down to his waist, remove his shoes and stockings, and, while waiting his turn, cover his shoulders with a blanket which hangs in the booth.

While the man is undressing, the nurse fills out a physical examination card bearing the

man's name, age, address and department in which he is to work. When the man is ready for the examination he steps into the examination room, and is introduced to the physician. The following examination is carried out:

1. The height and weight are taken.
2. The employee is then placed ten feet from a set of Snellen test charts, and each eye tested separately for distant vision. If he is unable to read English, object charts are used. The eyes are inspected for the presence of corneal scars or opacities, conjunctivitis or any other abnormal condition.
3. The ears are tested with an Ingersoll watch for acuteness of hearing and inspected for impacted cerumen or a discharge from chronic otitis media.
4. Then follows the inspection of the nose for deviation of the septum or occlusion by hypertrophied turbinates.
5. The teeth are inspected.
6. The throat and fauces.
7. The neck. The submaxillary-posterior cervical and thyroid regions are palpated for scars of previous abscesses or thyroid swelling.
8. The lungs are quickly percussed and auscultated, as much time being taken as is necessary to make sure they are sound. The same is done with the heart.
9. The man is requested to drop his trousers to the floor and the external abdominal rings are explored with the tip of the index finger. Pressure is exerted against the scrotum, pushing a fold of the skin upward with the finger into the ring. The size of the ring is determined and the man is asked to cough while the finger is still in the ring. A mass protruding through or pushing against the opening of the ring is easily felt except in cases of marked obesity. In some cases the examination can be made easier and more accurately by asking the man to bend forward at the hips at the same time relaxing the abdominal muscles and repeating the cough. The presence of a hernia is then easily determined. The groin is palpated, while he coughs, for slight bubonocele or direct hernia. The pressure of a slight bulging of the posterior walls of the abdomen is recorded. Inguinal adenopathy is determined by palpation.
10. The scrotum is palpated for varicocele and any other abnormal condition of the scrotum. As the examination is made with the intention of causing the least amount of embarrassment, questions in regard to venereal diseases are not asked the man.
11. The extremities are inspected, upper and lower, for amputations, varicose veins and flat feet.
12. The back is inspected and the man told to pull up his trousers, which he has dropped while the inguinal region and extremities were examined. As he bends over, the spine is inspected for curvature or prominent vertebrae.
13. The skin is inspected.
14. He is next placed on a table and the abdomen palpated. The heart is again auscultated for the presence of murmurs, which may have been overlooked while he was in the upright position.
15. He is seated near a desk, to which a Mercer syhygmometer is attached, and the systolic and diastolic pressure is taken by the auscultatory method. The patellar reflexes are tested.

This concludes the examination unless there are indications for urinalysis. A urinalysis is done on all men over 40 years of age and those with blood pressure above 140 mm. Hg. The examination takes from six to twenty minutes, according to the condition of the man.

The man then steps back in his booth and puts on his clothing, returning to the employment department through the same door by which he entered the booth. This does away with any confusion and does not interrupt the examination of the next man.

The physical defects are summarized on the back of the examination card, and the man is given a rating which is based on the opinion of the physician as to what kind of an industrial risk the man will make. This rating is placed at the bottom of a card made out by the employment department. The rating is indicated by the letters A, B, C and D.

RATING.

A—Signifies a perfectly normal man.

B—The man has one or two slight defects.

C—This rating is given to men over the age of 45 and to those with defects not severe enough for non-approval but which make them poor industrial risks.

D—represents those men considered bad industrial risks, and includes all ruptures, those with pulmonary tuberculosis and defective vision uncorrected by glasses. A rating of D is not always final, as it is often changed after men have returned with their defects corrected.

The employment department is notified in regard to bad defects, and they decide whether or not the man shall be rejected.

The following defects were found in 2000 consecutive examinations:

Defective vision: one eye	75
both eyes	89
Corneal opacities	10
Blindness in one eye	7
Strabismus	3
Sub. conjunctival hemorrhage	2
Cataract	1
Pterygium	1
Total	188
Not approved	27

Men whose vision in one or both eyes was reduced two-thirds of normal were approved only after they had provided themselves with properly fitted glasses. The men were told of the importance of having their vision corrected at

once, and were given the names of eye specialists, one of whom they were advised to consult at their earliest convenience.

Defective vision in one eye so severe that the man was practically blind in that eye was reason enough for non-approval except when a position could be found where there was no possibility of injuring the good eye, thus causing total disability. Although a large number of the men, not approved on account of defective vision, came back later with glasses, several men did not return.

Throat and Mouth.—Very few men had perfectly good teeth, and a large number had symptoms of pyorrhea alveolaris. Hypertrophied tonsils were present in seventy-nine cases.

Nose.—As a perfectly normal septum is rarely seen, only those cases of marked deviation were recorded. Many of these were associated with external signs of a previous fracture of the nose. The high arch with narrow palate, which is mentioned in the textbooks as an etiological factor of deviated septum, was rarely encountered.

Obstruction of the nose, causing mouth-breathing, no doubt has some bearing on the health of those working in dusty departments, and when present in a man with any respiratory trouble should call for caution in placing the man. Men with deviated septa frequently come to the company hospital from dusty departments, complaining of a dry throat with slight cough and hoarseness. Rarely was it necessary to transfer them to other departments after they had received local treatment with instructions as to the simple hygiene of the nose and throat. Those cases with severe deformity of the septum were told how the defect could be corrected by operation. One hundred and thirty-four deviated septa were recorded.

Lungs—The same care was taken in placing men with impaired lungs. Men found with active signs of pulmonary tuberculosis were not approved. A few cases with inactive signs in one lung were not approved for work inside the factory. Men with active tuberculosis before being rejected were told their lungs were not normal and were advised to consult their family physician at once for advice and treatment.

DEFECTS OF LUNGS.

Pulmonary T. B.	10
Acute bronchitis	5
Chronic bronchitis	6
Emphysema	2
Scar of old empyema	2
Dry pleurisy	1
Asthma	1
Total	27
Not approved	4

Heart.—Sixty-eight men were found with heart murmurs which were summarized as functional or organic endocarditis. Unless there were physical signs of broken compensation, they were allowed to work, but were later required to report at the hospital to be checked up. Experience has shown that factory employees with heart lesions are able to continue at work without detriment to their health if they are properly supervised and examined from month to month. Three men with cardiac lesions, accompanied by hypertension and nephritis, were not approved.

Extremities.—The most frequently-found defect was flat-foot, varying from a simple sagging of the arch to more severe deformity, characterized by absence of the arch with pronation. A large number had a mild form of flat-foot associated with hallux valgus. Questions asked men with flat-feet usually failed to give a history of previous trouble, although many of the men later came to the hospital for treatment. Two men with artificial legs were accepted. Amputated fingers and deformities of the elbow joints from old fractures were not considered bad industrial risks, as the men had become accustomed to the deformity and had gained a dexterity which gave them perfect control of the hand or arm.

DEFECTS OF EXTREMITIES.

Flat-feet	347
Varicose veins	8
Ankylosis of elbow	3
Amputations: leg	2
toes	3
fingers	6
Chronic phlebitis	1
Chronic infantile paralysis	1
Total	371

Abdomen.—Very few defects were recorded in this region. Frequently a laxity of the posterior walls of the abdomen, with slight bulging on coughing, was noted. Although simulating an inguinal hernia, it was usually associated with a normal external ring. Eighteen men had appendectomy scars. Two ventral and one umbilical herniae were recorded.

Inguinal Region.—Rupture is by far the most frequent cause for non-approval. The following classification of hernia, accepted by the Conference Board of Physicians in Industrial Practice, was used for tabulating the condition of the external ring.

First Degree,—The external ring admits the tip of the finger.

Second Degree.—The external ring admits the thumb and there is some impulse against the thumb.

Third Degree.—A definite mass is present in the inguinal canal when the patient coughs, or on standing.

Fourth and Fifth Degrees.—When the mass passes the external ring and protrudes into the scrotum or bulges through abdominal muscles.

The following degrees of hernia were recorded:

2° hernia (not true hernia)			277
3° "	right side	7	
	left "	0	7
4° "	right "	9	
	left "	5	14
5° "	right "	11	
	left "	5	16
Both sides, 3°		4	
" " 4°		8	12
Total			326
Not approved			49

All cases with third degree hernia, or more, were not approved. Those having large external rings were cautioned against unnecessary straining while lifting. A large majority of the men discovered with hernia were unable to give a definite history of the time of rupture and several were unaware of the defect. Three men were wearing trusses as a prophylactic against rupture. All had perfectly normal rings and there was no bulging in the groin.

Genito-Urinary Region.—Defects of this region were mostly varicocele. No defects were found severe enough to warrant non-approval, although one man admitted before being examined that he was suffering from acute gonorrhea. He withdrew his application for work when informed that he would not be approved. This is a rather unusual record, as it was the only case of venereal disease encountered in the 2000 cases.

Varicocele was classified as follows:

First Degree.—Thickening of the cord.

Second Degree.—Thickening of the cord and dangling testicle and scrotum.

Third Degree.—Thickening of the cord and dangling testicle and scrotum with laxity.

A severe form of varicocele, with impulse on cough, was frequently encountered, requiring differentiation from a hernia.

DEFECTS.

Varicocele	154
Atrophy of testicle	9
Hypertrophy of testicle	6
Absence of testicle	2
Hydrocele	2
Undescended testicle	6
Total	179

Spine.—Because of the frequency of strained backs which come to the hospital for treatment, special care was taken to keep men with defects of the spine out of those departments requiring heavy lifting. Slight lateral curvature of the spine was noted in quite a few cases. The lateral curvature with a rigid spine was differentiated from the flexible postural defect by having the man draw his body up by his hands on one of the doors of the examination room. The upright rod attached to the weighing scales was utilized for comparing the height of each shoulder. Several lateral curvatures of the spine, due to posture, were told of their condition and advised to take exercises for overcoming the deformity. Three cases of chronic Pott's disease were approved for positions not liable to aggravate their condition.

DEFECTS.

Lateral curvature	15
Anterior curvature	3
Chronic Pott's disease	4
Total	24
Not approved	1

Skin.—The following skin lesions were recorded:

Acne	50
Psoriasis	3
Eczema	3
Fatty tumors	5
Cysts	4
Urticaria	1
Pernicious anemia	1
Thyroid enlargement	1
Total	68

Blood Pressure.—The following results are shown from 1000 observations of the systolic and diastolic pressures. The blood pressure readings are divided into ten-year periods.

	AGE 15 TO 30 YEARS	AGE 30 TO 40 YEARS	AGE 40+ YEARS
Systolic pressure	127	133	144
Diastolic pressure	80	81	91
Pulse pressure	47	52	55
Pulse	84	81	81

The averages are somewhat higher than those given in life insurance statistics, but the following factors may be a cause of the higher averages.

1. The readings were on men doing fairly hard manual labor.
2. They were taken after a hearty meal between the hours of one and four o'clock in the afternoon.
3. The anticipation of the examination probably had a psychic influence on the pressure. This was noticeable by a quickened pulse rate and frequent questions from the men who were ignorant of the use of the sphygmometer. Many entertained an idea that some form of electricity was being applied when the cuff was attached.
4. Occasionally men had used alcohol a short time before coming to the factory for work.

Young men 18 or 20 years of age frequently gave a systolic pressure of 130 mm. Hg. and above. The initial reading is not always a true reading, as experience has shown that a second reading five or ten minutes after the first reading invariably gave a lower result. Men when examined at some later date also showed a lower reading as a general rule. The auscultatory

method was found to be more accurate than the palpatory method, but gave a slightly higher reading. The extra time consumed in taking both the systolic and diastolic pressure is practically nil, and fewer failures to get a reading were encountered by the former method. Sixty-five men with functional and organic heart murmurs averaged the following blood pressures.

	Up to 20 Years	Age 30 to 40 Years	Age 40+ Years
Systolic	138	152	148
Diastolic	95	85	82
Pulse pressure	43	67	66
Pulse	78	77	88

CONCLUSIONS.

1. The average man going about his daily work has minor defects which at the present time cause him no discomfort, and he is unaware of their presence. Many have never had a complete physical examination—in fact, many have never required the services of a physician. These minor defects, if not attended to, may later on become a menace to their health, and be a direct cause of disability.

2. The industrial physician is in a position to give advice to the factory employee before he goes to work, and often can prevent men being placed in departments which might be detrimental to their physical welfare.

3. The men appear interested in knowing the result of the physical examination, and seldom resent being rejected for some position which is liable to cause disability, if they have previously been told why they are not fit for the position.

Harvard Medical School.

THE FUTURE OF MEDICINE.*

BY PRESIDENT CHARLES W. ELIOT, HARVARD UNIVERSITY.

[Abstract of address delivered at the triennial dinner of the Harvard Medical Alumni Association at the Harvard Club, May 12, 1917.]

I HAVE had the privilege of knowing a good deal about the past sixty years of the medical profession. I appreciate fully the excellent picture which Dr. Thayer has just put before you of the medical education and the practice of medicine twenty to twenty-five years ago; and I have clearly in mind many earlier pictures of sixty, fifty, forty, and thirty years ago. I have personally witnessed large progress in the Medical School of Harvard University, in which two generations of teachers have taken part. At another medical meeting not long ago, I told of some of the things I saw in the Medical School of 1869; and I noticed that the picture I then painted caused some amusement among my medical audience. Indeed, some expressions of incredulity were visible,—particularly in regard to the students' attending six hours of didactic lectures on end five days in the week, and in regard to the extreme shortness of the required medical term, which then did not exceed four months out of the year. I noticed expressions of incredulity and amusement when I said that each candidate for graduation passed nine oral examinations of five minutes each, and won his degree if he passed in five subjects out of the nine.

If I reflect on the great progress in medical education, and the extensive changes in the medical profession itself since I first began to take notice of these matters, I can look forward with confidence to great progress in the future. I cannot find words to express the confidence I feel in the future progress of medicine as a science, as an art, and as the controller of many of the worst evils that afflict human society. The progress of the last sixty years, and our clear vision of the conquests still to be made should assure us all of the magnificent future of medicine.

One of the previous speakers alluded to my interest in preventive medicine. I have taken a strong interest in that branch of medicine, because that phrase covers an immense new service of the medical profession to the community, and much future happiness for the profession itself. To prevent evils and wrongs on a large scale by one's own personal wisdom and diligence gives even greater satisfaction than to cure individual cases of suffering from evils or wrongs, and the good done to the community by prevention is broader and ampler than the good done by curing. Within the last twenty years many new employments and serviceable positions have been opened to graduates in medicine who have made special studies in preventive medicine. Such are the chief positions in the Medical Corps of the army and navy, in and under boards of health, and in the sanitary service of cities, towns, and schools. The movement tends to the acceptance by medical men of salaries from public and semi-public boards, and from corporations in great number; salaries which yield a sufficient though modest support for a family, and permit the recipients to devote themselves, without interruption or distraction, to professional work, largely of a preventive character. The profession has long been familiar with service to insurance companies. It is going to become familiar with service to government—national, state, and municipal—and to corporations, educational, charitable, and commercial. I lately visited two large manufacturing corporations that were paying good salaries to medical men and nurses who devote their whole time to the corporations' workmen and their families, their services being both preventive and curative, but chiefly preventive. The indications are that in the future a larger

* Published in full in the Harvard Alumni Bulletin, Oct. 25, 1917.

and larger proportion of men well educated in medicine will devote themselves chiefly to preventive medicine. This change is by no means to be regretted. On the contrary, the profession and the community are to be heartily congratulated on it.

Important changes have already taken place in the private practice of both physicians and surgeons. The automobile and the telephone have enlarged the territory over which a skilful man of good quality can comfortably practise; and these new facilities promote the most cheerful, discerning, and skilful men, at the expense of the less cheerful, discerning, and skilful. This change, of course, supports sound and well-directed medical education.

The private practitioner, whether physician or surgeon, is getting more and more dependent upon laboratories, and on experts in the use of complex apparatus, and in the making of complicated tests or explorations for diagnostic purposes. The increase in the number of these, and indeed in the public appreciation of specialists, gradually led to a new method of determining fees in a part of the medical profession. Fees increased very much, not only for surgical specialists but for the obstetrician as well. Then the method of charging "what the traffic will bear" came into use. We all know that there are now some large medical establishments which proceed on that rule, taking much pains to determine what the probable or ascertainable income of the patient is. It is not clear to the learned and scientific professions at large that the honor and dignity of the medical profession have been advanced by the use of this method.

In the present crisis in the life of the American people, the medical profession cannot but rejoice that it was better prepared for war service than any other profession in the country, including the military and naval profession. It was prepared to apply every medical and surgical invention of the last fifty years at once for the benefit of the army and navy. It did apply inoculation for typhoid, and conducted a successful resistance to typhus. It was already preventing yellow fever, and curing and preventing hookworm disease and malaria. It promptly demonstrated that surgery was something more than cutting off and cutting out—it could rectify and repair. It could make immediate application in war of the recently discovered improvements in orthopedic and dental surgery. The first aid which America was able to give to the European combatants was medical aid. This country is not ready yet to give effective military or naval aid; but we were ready to send in the first year of the war doctors, surgeons, nurses, and orderlies by the thousand, thoroughly prepared to render efficient service at the great hospitals at the front or in the rear. In war as in peace, the medical profession has shown itself to be thoroughly altruistic, beneficent, and self-sacrificing.

The medical profession in America justly claims to have developed and greatly improved the vocation of nursing, and to have invented and established the district nurse, and the social worker in connection with hospitals and dispensaries. The district nurses and the social workers going out from hospitals form a new class of teachers whose contribution to the welfare of the community grows more and more important. The family physician also is becoming more and more a teacher of hygiene, a preserver of health and an adviser in family anxiety and distresses.

The future of medicine is bright beyond compare. It is in full harmony with the democratic spirit which is pervading the world, with the new sense of human brotherhood, and with the new conviction that religion is not forms and ceremonies, or rites and dogmas, but a tolerant, friendly, and coöperative spirit, which prompts to common good works.

ADDRESS.

BY G. F. FREEMAN, SURGEON, U.S.N.

I FULLY appreciate the honor of being present tonight to represent the Medical Corps of the Services, and have the added pleasure of being among classmates and former teachers. I have asked permission to vary the subject originally assigned me, and to speak of the general medico-military tasks of the army, navy, and medical profession at large.

Just as the medical profession of this country is composed of the most varied types of physicians, engaged in diverse lines of research, or work in the practice of their profession, so also the medical department of a great army and navy requires the services of men of the most varied talents and achievements. A rational scheme of national defense must include all these types and, furthermore, discern their special talents, so that all may with the least loss of efficiency fit into some cog of the national need. There is no one but what can help in some way.

There are three great tasks confronting the medical profession, each task having many subdivisions:

First, we must aid the Allies by base hospitals and medical supplies. This work is already started, and Harvard is the first to respond to this call.

Second, we must meet the great obligations to our own army and navy by supplying the necessary number of medical officers, and there must also be others in training to fill vacancies.

Third, all this must be accomplished with the least possible disarrangement of our vast medical obligations to the community, and to the industries we must conserve.

We have, as a country, passed one stage of the preparedness journey—that of providing

for the establishment of a suitable army and navy.

We have also started to meet the first of our particular medical obligations, that of sending medical aid to Europe.

What we as a nation should have done in the past it is now futile to discuss, for we are already in the midst of the second part of our work,—that of providing and training the military establishment, this latter including those of the medical profession who will be called to duty in different capacities.

The very first work in the formation of any military force is the physical examination of recruits, and this work requires the services of a great force of doctors, who must be somewhat trained in the special peculiarities of recruiting for military service. The medical profession of the United States will thus be severely taxed from the first, as has been that of England and France.

These tasks can be better understood by the following estimates of increments than increases. First, in regard to the navy, as the problem is less than in the army, although the country must have ships of all classes before any concerted aid can be given.

In the summer of 1916, Congress authorized a navy of 77,956 enlisted men, and by special authority vested in the President, this force was increased to 87,000, not including the present strength of the army, navy, and National Guard, and was recently increased by Congress to 150,000. The United States Marine Corps, which is the mobile army within the navy, has been increased, first to 17,000, and recently to 30,000. The above numbers do not include officers nor certain classes of enlisted men. The navy allows six and one-half medical officers per 1000, and an estimate of the increase in the Medical Corps of the navy is something over 700. In June, 1916, the total strength of the Medical Corps of the navy was 332; thus the corps will be three times as large in the future as in the past. For a division of marines taking the field, there will be required about 156 naval medical officers, or about one-half of the former number in the entire navy. They are also allowed medical reserve officers who will soon be fully experienced in navy life, and all will be needed, some as specialists, and some for regular duty.

These problems of the navy are great, but for the army the task is proportionately greater.

First, there will be the increments to be filled by volunteer enlistments. To fill the authorized war strength of the army: 161,519 men and officers. To fill the war strength of the National Guard: 206,349. First training "cadre" or those necessary by War Staff College recommendation—to train the 547,000 of the first selective draft, thus leaving that number of *vacancies* for the voluntary increments in the army and the National Guard: 160,000. Recruit training units for the National Guard, to replace casualties, and those sick, estimated at one-third of the full strength of the force: 110,000. Recruit training units for the regular army: 98,000. Total estimated: 736,000. The above estimates are for what might be called the volunteer force, as opposed to the selective draft, which would add 547,000, or a grand total of 1,283,000 increase. By comparison of volunteer and selective draft, the volunteer increment is greater than the selective draft.

The army allows 7 medical officers per 1000, and the new forces alone would require between 9000 and 10,000 in the Medical Corps. Of this number about 2000 will be required for the Regular Army, which in 1916 had 440 in the Medical Corps, and thus in the future, will be more than five times as large as in the past.

Many of those who will be called are already in the service as reserve officers; they will, however, be taken from those who are available for work in civil life. The above numbers seem large, but are estimated from figures given by the secretary of war and the secretary of the navy.

The country, out of its 120,000 physicians, will have to meet this demand, and the medical profession is already doing its share. I have so often heard the expression, "If the country needs me, I want to go," that I have taken it as the sentiment of the medical profession at large. It means that there will be very little selective drafting for the medical profession; it will be a volunteer offering.

The third great task of the medical profession is to conserve the interests at home. This work will naturally fall on those who are over the military age, or on those who are not physically qualified for military services, but are, nevertheless, qualified for hospital duty and active practice. They will have to do their bit by *serving* their country *at home*, while their brothers of the army and navy are doing the *active service*.

The army and the navy are doing their best to train the Medical Corps for the special duties of war, and the medical profession on its part is responding to the call for more medical officers. Harvard is among the first in all the branches of work, and in furnishing officers for the Medical Corps of the army and the navy (8 ambulances).

To meet the need of the thousands of Medical Corps men needed, the medical profession of the United States faces a great responsibility. It means sacrifice, but the spirit of self-sacrifice is inherent in the doctor.

In speaking of the sacrifices of eminent men in the *Medical World*, Lord Northcliffe said: "If there be degrees of chivalry, the highest award should be accorded the medical profession, which at once forsook its lucrative practices in London, Melbourne, and Montreal, in a great rally of self-sacrifice. The *history* of the great sacrifices among them brings home to those who have only the big hospital idea of the war doctor, sad facts which should lead to due

understanding of this veritable body of Knights Templars in this great Crusade." There is already the spirit in this country that will entitle the medical profession to the same praise as given by Lord Northcliffe. We have traditions of past wars and examples to which we can point with pride, and I have faith that we will follow these examples.

It is not the army surgeon or the navy surgeon alone that merits all the praise, or the fact that the doctor is serving with a military unit, that entitles him to an award. He is only a part of a greater fraternity—the medical profession—which has its deeds of chivalry in peace as well as in war. Whether the doctor is in the service of his country with the army or the navy, or is working for the same country at home, the spirit is the same.

The work has been started, and there comes the added responsibility of the continuance of the work next year, and possibly some of the years that follow; thus preparedness is not only for this year but also for future years.

"Heaven gives the crown of victory to those *only* who, by habitual preparation, win without fighting, and at the same time forthwith deprives of that crown, those who, content with one success, give themselves up to the ease of of peace."

Book Reviews.

First-Aid to the Injured and Sick, an Advanced Ambulance Handbook. By F. J. WARWICK, B.A., M.B., M.R.C.S., etc., and A. C. Tunstall, M.D., C.M., F.R.C.S., etc. Tenth edition, revised, 250 pp. New York. William Wood & Company. 1917.

This small volume, now in its one hundred and forty thousandth printing, is as excellent a handbook of first aid as the market affords. It is particularly pertinent in that it contains directions for the care of the wounded on the battlefield such as has proved best by experience in the present war. The first fifty pages are given to a brief exposition of the structure of the human body,—its bones and organs and their functions,—the blood and its circulation, respiration, digestion, etc. Part II treats at considerable length of bandages, and gives over one hundred illustrations of methods of applying. The section of hemorrhage and wounds contains over thirty illustrations; that of dislocations and fractures about forty illustrations and artificial respiration and transportation of the sick and injured about one hundred illustrations. The last section on transportation is especially admirable, and covers this subject from the rescue of persons from burning buildings and mines to exhaustive directions for carrying soldiers from the battlefield. The book is highly to be recommended.

A Text-book of First-Aid and Emergency Treatment. By A. C. BURNHAM, M.D., Medical Corps U. S. R. Philadelphia and New York. Lea & Febiger. 1917.

The experience of many years in the emergency wards of some of the largest New York hospitals is the basis of this book. It is intended as a text-book for the untrained first-aid worker as well as the advanced student who may be expected to practice his art under the conditions of modern warfare. The character of the text deviates considerably from that of many of the older books, the student being drilled in the principles of diagnosis and treatment instead of being limited to didactic rules of procedure in individual cases. Because of its attention to common accidents and illnesses and to the explanation given of their symptoms and the structures and functions of the part of the body in which they occur, the book is especially well adapted to the home nurse.

Food for the Worker. By FRANCES STERN and GERTRUDE T. SPITZ. With a foreword by PROF. L. B. MENDEL. Boston. Whitcomb & Barrows. 1917.

This volume is the outgrowth of an experience as visiting housekeeper both with the Association for the Relief and Control of Tuberculosis and with the Boston Provident Association on the part of Miss Stern, assisted by Miss Spitz, who was Dr. Locke's assistant in the preparation of his book on "Food Values." It presents, in condensed form, a statement of food requirements of a working family, the cost of such food and the manner in which food can best be purchased and cooked.

The authors have prepared menus for seven weeks with tested recipes giving food values and costs for the dishes included in the menus. The daily cost of food is on the basis of twenty cents per day per person, at prices of 1914. In the supply sheet, prices up to July, 1916, have been given. All weights of the component food principles are figured, and also the values in calories of each serving. The cost in cents is given for each serving.

Whatever may be the changes in prices, this attempt to solve the problem of an adequate, *varied* diet on an inadequate wage is one that must be of great service not only to all social workers, but to any intelligent housekeeper of moderate income who wishes a foundation on which to build a family's diet.

THE BOSTON
Medical and Surgical Journal

Established in 1812

An independently owned Journal of Medicine and Surgery published weekly, under the direction of the Editors and an Advisory Committee, by the BOSTON MEDICAL AND SURGICAL JOURNAL SOCIETY, INC.

THURSDAY, NOVEMBER 1, 1917

EDITORS.

ROBERT M. GREEN, M.D., *Editor-in-Chief.*
GEORGE G. SMITH, M.D., *Assistant Editor.*
WALTER L. BURRAGE, M.D. *For the Massachusetts Medical Society.*

COMMITTEE OF CONSULTING EDITORS.

WALTER B. CANNON, M.D. — ROGER I. LEE, M.D.
HARVEY CUSHING, M.D. — ALLAN J. MCLAUGHLIN, M.D.
DAVID L. EDSALL, M.D. — ROBERT B. OSGOOD, M.D.
REID HUNT, M.D. — MILTON J. ROSENAU, M.D.
EDWARD C. STREETER, M.D.

ADVISORY COMMITTEE.

EDWARD C. STREETER, M.D., Boston, *Chairman.*
WALTER P. BOWERS, M.D., Clinton.
HOMER GAGE, M.D., Worcester.
JOEL E. GOLDTHWAIT, M.D., Boston.
LYMAN A. JONES, M.D., Swampscott.
ROBERT B. OSGOOD, M.D., Boston.
HUGH WILLIAMS, M.D., Boston.
ALFRED WORCESTER, M.D., Waltham.

SUBSCRIPTION TERMS: *$5.00 per year, in advance, postage paid, for the United States. $6.56 per year for all foreign countries belonging to the Postal Union.*

An editor will be in the editorial office daily, except Sunday, from twelve to one p. m.

Papers for publication, and all other communications for the Editorial Department, should be addressed to the Editor, 126 Massachusetts Ave., Boston. Notices and other material for the editorial pages must be received not later than noon on the Saturday preceding the date of publication. Orders for reprints must be returned in writing to the printer with the galley proof of papers. The Journal will furnish one hundred reprints free to the author, upon his written request.

The Journal does not hold itself responsible for any opinions or sentiments advanced by any contributor in any article published in its columns.

All letters containing business communications, or referring to the publication, subscription, or advertising department of the Journal, should be addressed to

ERNEST GREGORY, *Manager,*

126 Massachusetts Ave., Corner Boylston St., Boston, Massachusetts.

THE DETERMINATION OF RENAL FUNCTION.

THE lowering of the operative mortality in kidney conditions from the high mark of over 50% not many years ago, to the present low mark of about 10% is, perhaps, due more to the development and the use of the newer tests for kidney function than even to better surgical technic. Without a definite knowledge of the ability of the kidneys to withstand the effects of an operation without a disturbance of the balance of circulation, resulting in acute congestion, suppression of urine and uremia, operations must be expected to end disastrously. In such cases operations will shorten life rather than prolong it. Where only one kidney is potent, of course the removal or serious operative injury to the other must end fatally as a direct result of the operation. The determination, on the other hand, that the kidneys are below par, the introduction of the proper regimen, and the postponement of operative interference until improvement is shown by the functionation tests, will save many patients.

Of the various methods devised to test the functional capacity of the kidney, the test for urea is the oldest and still much used. It can be used for the determination of the capacity of both kidneys or of each separately. The total excretion of urea for both kidneys, or the comparative excretion for each separately on catheterization of the ureters, are the indices of function. At present the phenolsulphonephthalein—phthalein—test and the phloridzin test are used to determine the functional capacity of both kidneys, while the indigo-carmin test is used to determine the capacity of each kidney separately. For the first test the profession is indebted to Geraghty and Rowntree. For the develópment of the phloridzin test credit is due to Greene. Völcker and Joseph were the first to use the indigo-carmin test. The phthalein test depends upon the elimination by the kidney of urine that assumes a bright red color upon the addition of an alkali. The percentage of drug elimination is determined by comparing the intensity of the color with a standard solution of known strength by means of the calorimeter. In making the test about 1 cc. of the standard test solution is injected into the muscles of the back. The estimation of renal capacity is made by collecting all the urine after an hour, then after two hours, and so on, being repeated even for weeks in doubtful cases. The amount of secretion is estimated by the calorimeter. When the appearance of the drug is delayed more than 25 minutes and the output is less than 20% for the first hour, then operation must be postponed. But it is not so much the percentage or quantitative production that is the important factor in this test, as the ability of the kidneys to maintain a production without diminution, no matter how small, over a long period. It is when the capacity of the kidney to excrete this drug is diminishing, or when to begin with there is only a trace, that operation must not be undertaken. When the quantity is maintained, even if very low, operation may be undertaken in selected cases. This test is the best test for stability in function. Cases of prostatic obstruction with large amounts of residual urine are less likely to maintain the quantity than the chronic catheter cases. The phthalein test is the test of election in determining function in prostate operations.

The phloridzin test depends upon the fact that this drug causes a peculiar activity of the kidney tissues, enabling them to withdraw sugar from the blood and to excrete it. When function is good, large amounts of sugar will be excreted on the injection of the usual 30 minims of a 1-400 solution. Normal kidneys should excrete at least 1% of sugar. In this test the delay in the time of excretion is, perhaps, as important as the quantity. A delay of over 30 minutes is a danger sign, and indicates some profound pathological disturbance of the kidney.

The time factor, however, is the most important factor in the indigo-carmin test to determine capacity of the kidneys separately, in contradistinction to the quantity factor in the other tests. After the injection of this drug into the muscles, a blue stream of urine should be observed with the cystoscope to flow from the orifice of the ureter, in from five to eight minutes. Delay in the appearance of the blue stream spells incapacity of the kidney on the side on which there is this delay. The degree of time of delay determines the degree of incapacity. The cystoscopic observation with a watch are the determining factors with this test.

AN APPEAL TO THE PROFESSION.

THE Association of American Medical Editors issues a call to the physician to enter his country's service at this time of need, and we are glad to print in these columns this appeal, in the hope that it may impel those of our readers who are in circumstances which permit, to enter the Medical Reserve Corps.

In this world's war, your service is absolutely essential. The medical officer bears the same relative position in war as in peace, in that he is a conservator of health and life. Through his skill, thousands of men receiving slight casualties are returned to the fighting force, thus conserving the physical strength of the army. In base, field and evacuation hospitals, doctors are as essential as in civil institutions, where the sick and injured are cared for. As regimental surgeons and on transports and in the Sanitary Corps, must the Government have doctors if we are to terminate this war successfully.

Your contribution to your country at this critical time is your service, which you can give for the period of the war as an officer in the Medical Reserve Corps. That your country needs you, is best answered in that she is calling you now.

The fighting forces are constantly expanding, and such expansion calls for additional doctors, and even with the troops now in training and under mobilization (about two million) the Surgeon-General has not enough doctors to fill the requirements.

Young physicians, never again in the history of medicine in this country will such an opportunity be afforded you to serve your country as well as the best interest of yourself.

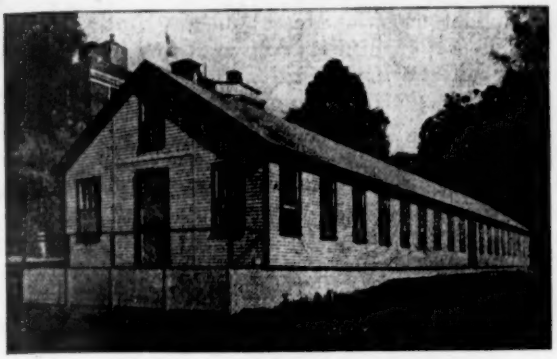
The experience which you will gain by being commissioned in the Medical Reserve Corps and seeing active service, will be worth more to you in a professional way than you could acquire in years of practice in civil life. The pay granted to officers in the Medical Reserve Corps is sufficient not only to cover all needs, but to enable you to lay aside a comfortable balance, and while the older men in the profession have come forward, it is to the younger men that the greatest benefits accrue.

The experience will prove broadening, both professionally and mentally. With this experience and the thought that you have served your country in time of need, you will return to civil life and receive the further benefits from your patients, friends and acquaintances, always accorded to one who has been so prominently individualized as this opportunity will afford you.

Secure an application blank at once; fill it out and present it to your nearest examining board. Do not live to regret that you did not have a part in your country's great struggle for democracy, which means liberty.

A PORTABLE HOSPITAL UNIT.

ON Monday afternoon, October 15, the portable hospital unit erected by the New England Deaconess Association near the Deaconess Hospital, Longwood, was informally opened to the public for inspection. This building, which is known as the Willard T. Perrin Ward, is the first portable hospital unit to be built within the city limits of Boston for the benefit of sick and injured soldiers and sailors. It is a practical duplicate of the portable field hospital now in use in France.



"This hospital is a complete unit, equipped with thirty-five beds, including three private rooms that may be used for special cases, and with service rooms usually found in any up-to-date hospital ward. The building is practically the same as those now in use as field hospitals in France, and was suggested by Dr. Daniel Fiske Jones, who was a member of the Harvard Hospital Unit in France last year. It is 108 feet long, 20 feet wide, one story high, and has an abundance of light and air. It will be heated and lighted from the present hospital central plant, so that it may be used during the winter months, the pipes and wires being carried underground to the building. Modern plumbing is installed, and in every way the comfort of the patients has been considered.

The cost of this unit, complete, furnished ready for service, will be between $5000 and $6000. The Government has been notified that patients will now be received at any time, either in this building or at the main hospital. This ward unit is named the 'Willard T. Perrin Ward of the New England Deaconess Association for Sick and Injured Soldiers and Sailors.' The committee which has had the construction in charge consists of William T. Rich, chairman, Dr. Daniel Fiske Jones, Clarence W. Williams, Willard T. Perrin, Miss A. A. Betts, Mrs. F. H. Eaves, Miss Ellen T. Emerson, Mrs. H. C. Gallagher."

MEDICAL NOTES.

INCORPORATION OF "PEDIATRICS" IN "MEDICAL REVIEW OF REVIEWS."—At about the time that the *Medical Review of Reviews* was founded, Professor Dillon Brown, of New York, established a semi-monthly journal devoted to the diseases of children, called *Pediatrics*. The opening article was by A. Jacobi, and the leading physicians of the city, among them J. Lewis Smith, Reginald H. Sayre and William H. Park, contributed to its pages. Latterly it has been edited by William Edward Fitch, but Dr. Fitch has recently been appointed a Major in the United States Army, and Dr. William J. Robinson, editor of *Medical Review of Reviews* has acquired his blue-pencil and subscription list.

Pediatrics will no longer appear as a separate publication, but has been incorporated with the *Medical Review of Reviews*. Beginning with January, however, the *Medical Review of Reviews* will contain a special department devoted to Pediatrics. This feature is but one of the improvements scheduled for the coming year. Important symposia are now in progress, and the editor will contribute a second series of Pathfinders in Medicine.

AMERICAN PUBLIC HEALTH ASSOCIATION.—The forty-fifth annual convention of the American Public Health Association opened in Washington on October 18. Herbert C. Hoover, director of the United States Food Administration, addressed the convention at its first general session.

The program for the afternoon called for a joint session of the Association with the American Social Hygiene Association, the Baltimore Medical Society and the Maryland Society for Social Hygiene, at which the chief topic for discussion was the social hygiene in training camps and the activities to reduce the prevalence of easily preventable disease in the army.

A symposium on easily preventable disease control in the army, the navy and the civilian community was given by Col. F. F. Russell, U.S.A.; Surg. R. C. Holcomb, U.S.N.; Raymond B. Fosdick, chairman of the commission on training camp activities; Asst. Surg.-Gen. J. W. Kerr of the Federal Public Health Service; and Surg. William H. Frost, director of the Red Cross Sanitary Service.

WAR NOTES.

TYPHOID FEVER IN THE NAVY.—According to the report of Surgeon-General Braisted of the Navy, typhoid fever and other communicable diseases have been virtually eliminated from the navy. This is despite the enormous increase in the naval forces. Since the war began less than ten cases of typhoid fever have been reported. Practically the only diseases which have given much concern during the present war have been those of the respiratory type, which are spread mainly by nose and throat secretions, principally mumps and measles,

This is in marked contrast to the experience of 1898, during the Spanish-American War, when the communicable intestinal diseases caused widespread damage and carried with them a high mortality rate. The application of recent medical science has practically eliminated such diseases from the forces afloat and ashore. Such modern methods for the prevention of intestinal diseases include preventive inoculations, the proper disposal of garbage and sewage, protection of food and water supplies from contamination, and the extermination of flies and their breeding-places.

ARRIVAL OF SIR BERKELEY MOYNIHAN.—The United States Medical Corps is fortunate in having the counsel and advice of Sir Berkeley Moynihan, who has been sent here by the British Government. Sir Berkeley Moynihan is senior consulting surgeon of the British Royal Army Medical Corps and inspector of army camps in France. He arrived in this country on October 18. During his stay he will attend the Clinical Congress of Surgeons in Chicago.

FIRE IN CAMP HOSPITAL.—The receiving ward of the base hospital at Camp Devens, Ayer, was destroyed by fire on October 21. The fire was caused by an explosion of an oil stove, and the flames spread rapidly through the wood and wallboard structure, but without injury to the occupants, who made their escape.

WAR RELIEF FUNDS.—On Oct. 27 the totals of the principal New England war relief funds reached the following amounts:

French Wounded Fund	$275,653.69
Armenian-Syrian Fund	240,667.54
Surgical Dressings Fund	127,934.99
French Orphanage Fund	124,976.72
Red Cross Fund	82,812.82
Russian Refugees' Fund	43,037.74
La Fayette Fund	32,491.03
War Dogs' Fund	1,624.25

BOSTON AND MASSACHUSETTS.

WEEK'S DEATH RATE IN BOSTON.—During the week ending October 20, 1917, the number of deaths reported was 195, against 229 last year, with a rate of 13.16, against 15.68 last year. There were 39 deaths under one year of age, against 34 last year.

The number of cases of principal reportable diseases were: diphtheria, 73; scarlet fever, 26; measles, 41; whooping cough, 16; typhoid fever, 2; tuberculosis, 58.

Included in the above were the following cases of non-residents: diphtheria, 16; scarlet fever, 6; tuberculosis, 5.

Total deaths from these diseases were: diphtheria, 9; measles, 1; whooping cough, 1; tuberculosis, 10.

Included in the above were the following non-residents: diphtheria, 5; measles, 1; whooping cough, 1.

MASSACHUSETTS STATE NURSES' ASSOCIATION.—The autumn meeting of the Massachusetts State Nurses' Association was held on October 27, 1917. The morning session was conducted by the Massachusetts State League of Nursing Education. The afternoon session was opened by the Private Duty Nurses' League. Miss Susan M. Cooke read a paper on "A Journey to Russia," and Miss Annette Fiske read a paper on "What the Waltham Nurses Are Doing in Europe."

Through the American Nurses' Association and in accordance with a request from the General Medical Board of the Council of National Defense, the Massachusetts State Nurses' Association has undertaken a survey of the nursing resources of this state. To this end a letter, enclosing a card for registration, has been sent to all nurses in institutions, in alumni associations, training schools and directories and also to those who have taken Red Cross home nursing courses, asking that they fill out the card and return to the Association. The letter states that this survey is a war emergency measure and can be accomplished only by the loyal coöperation of each and every member of the nursing profession in Massachusetts.

APPOINTMENT OF ATHOL PHYSICIAN.—Dr. Benjamin W. Gleason of Athol, Mass., has been commissioned captain in the medical corps of the regular army. He expects to be sent first to Fort Benjamin Harrison and then to France. Dr. Gleason is a graduate of the University of Pennsylvania.

GRADUATION OF NURSES AT BRIGHAM HOSPITAL.—There were graduated from the Peter Bent Brigham Hospital on October 26, a class of 27 nurses. The exercises were held in the evening at eight o'clock, and were followed by a reception.

NORTH BERKSHIRE MEDICAL ASSOCIATION.—The regular monthly meeting of the Medical Association of Northern Berkshire was held in North Adams on Tuesday evening, October 16. Dr. A. J. A. Hamilton of Boston read a paper on "Stomach and Intestinal Lesions," illustrated by stereopticon pictures of x-ray findings and operative technic.

MASSACHUSETTS WOMEN'S HOSPITAL.—The remodeling and refitting of the Massachusetts Women's Hospital on Parker Hill, Roxbury, is completed and it has been opened for the reception of patients. Miss Zillah McLaughlin, formerly superintendent of the New England Deaconess Hospital, is in charge and the staff includes Dr. Charles Hare, Dr. Edith M. Brooks, Dr. Ernest B. Young and Dr. Henry T. Hutchins. In response to a request from the Government, the trustees have offered the service of the hospital for the use of women in Government employ who require treatment not to be had at military hospitals.

LICENSING OF DISPENSARIES.—Michael M. Davis, Jr., director of the Boston Dispensary, in advocating a license system of the medical dispensaries of Boston, states his reasons as follows:

"Twenty-five to thirty well-established and reputable dispensaries exist in Boston, treating fully 200,000 men, women and children annually. They are, to a large extent, the poor man's doctor. They are also supplying the services of specialists to wage-earners and others of small means who may have their private doctors in ordinary circumstances, but who cannot af-

ford the surgeon, the oculist, the throat specialist, the orthopedist, etc.

"Fattening upon the needs which these public service institutions are trying to meet, there have grown up a few dispensaries conducted for profit, and also some conducted nominally as charities, but really for the support of those who are their officers or managers. Any institution which publicly offers medical treatment to the people should submit to some definite form of public regulation and inspection.

"The law of Massachusetts, as administered by our State Board of Charity, already furnishes a measure of protection against the improper use or solicitation of charitable funds, but there is no public body now authorized to license and inspect dispensaries in order to see if they are reasonably equipped to treat disease, that the arrangements are not such as will disseminate contagion, and that the physicians on their medical staff are legally entitled to practice. A license should be required for every dispensary; the licensing authority should have power to outline reasonable sanitary and medical conditions for the conduct of dispensaries, and to revoke or refuse to renew a license when necessary, after a hearing; and regular inspection should be provided for.

"Profiteering out of the misery of the sick poor, or providing treatment under unsanitary conditions, should not be tolerated. The prosecution of evil-doers will be occasionally necessary under any conditions, but continuous public regulation would prevent most evil-doers from attempting to enter the field at all."

BRISTOL COUNTY TUBERCULOSIS HOSPITAL.—Talaquega Park, in Attleboro, Mass., has been the location chosen for the erection of the Bristol County Hospital for the tuberculous. The State Department of Health sanctioned the purchase of this site. Its existing buildings, which were used as a summer resort, will permit remodeling into permanent structures. The cost was about $75,000.

BOSTON DISPENSARY EVENING CLINICS.—The managers of the Boston Dispensary have voted to open clinics on Monday and Friday evenings for wage-earners who cannot give up their work during the day. This new service will be general, and in addition to the throat, skin and genito-urinary clinics now maintained at the Dispensary. Charles F. Weed, William Power Blodget, Robert W. Maynard and Miss Ellen F. Emerson have been added to the board of managers.

NEW ENGLAND.

CHARITABLE BEQUESTS.—By the will of the late Sarah M. D. Gardner, widow of Judge William S. Gardner of Boston, the Rhode Island Hospital receives $25,000, and the American National Red Cross, $1000.

NEW ENGLAND SURGICAL DRESSINGS COMMITTEE.—The Surgical Dressings Committee, with its headquarters at the Peter Bent Brigham Hospital, has become an auxiliary to the Red Cross. It will continue its activities as heretofore, but will open, in addition, a workroom at 236 Beacon Street. Funds are urgently needed and may be sent to the Committee in care of the Old Colony Trust Company, 17 Court Street, Boston.

The Massachusetts Medical Society.

NOTES TAKEN AT A HEARING BEFORE THE SPECIAL COMMISSION ON SOCIAL INSURANCE AT THE STATE HOUSE, BOSTON, SEPTEMBER 26, 1917.*

DR. SWEETSIR of Merrimac: We haven't any laboratory or x-rays in our little town; we haven't a whole lot of these clinical things that we would like, but every practitioner in Massachusetts who is successful, even in the little towns, surrounds himself with his eye man, with his nose and throat specialists, his ear man, x-ray man, and surgeons, and he is perfectly competent,—much more competent than the patient,—to know when the patient needs that service. We have all these things at our command. If an x-ray is needed, an x-ray man comes and takes one if the patient can't go to the office. If I have some tonsils to be taken out, or some ear work to be done, my patient is taken to the one who does that work, or the specialist comes to us. And he does that for what I say the patient can pay. If I send to him patients who can pay, he is coming for nothing if I have a patient who can't pay; and I have no one who takes issue with that stand. I feel that my clientele are taken care of very well and have no need of any legislation to help them out. I am open to any suggestion that will help me or the patient, and when anybody brings that suggestion to me or to the Society, I will accept it and work hard for it.

"Is the cost of medical care and attention beyond the reach of the ordinary workingman today?" That is best answered, I think, by stating that 80% probably pay their bills in full to me. Now that doesn't mean that one man pays me the same as another. If my arm were broken, I would be perfectly willing and feel able to pay a bill of $100 or $200 to have it taken care of properly; but that would be out of the reach of a man earning $18 a week, with a family of children. His fee would be entirely different from that. When it comes to the poor, what are you going to do? What would I do if called to a washerwoman with three or four children, earning her living, if I found one of the children suffering from acute appendicitis and needing surgical attention? It would be too far to take her to the Haverhill Hospital, which is the nearest one. I would go to the overseers of the poor and tell them I had a child down there who needed a surgeon and I wanted her taken care of. The overseers would say, "We don't want anybody to suffer; get your surgeon and the town will pay for

* The remarks of other physicians at this meeting appeared in the JOURNAL October 25, 1917, p. 603.

it." And I get the surgeon and I apparently get better results than they do at the ordinary general hospital.

"How can the State aid further in extending the work of preventive medicine?" You have the State Board of Health, and it is their business to attend to it.

REP. GREENWOOD: If we have any instructions to give the Board of Health we can instruct them. Perhaps the thought is to put it under their control.

Ans. As I say, I would be very glad to support any suggestion that was practical along any of these lines.

REP. GREENWOOD: Suppose a dispensary were established in Haverhill or Newburyport; would that be advantageous?

Ans. Then would come in the personnel of the clinic. What is the ability of the medical men who are there? I have seen a whole lot of dispensaries where I wouldn't want any of my family treated. If you propose to establish a dispensary in all the larger or smaller centers, under the supervision of the State, how practical would it be from a financial standpoint?

REP. GREENWOOD: Whether the people are benefited in their health would be the idea.

Ans. Is it your idea that it shall be a privately conducted thing, run by the board of health, or special committee? If you can empower the State Board of Health to give me a dispensary where I can send in and get x-ray plates free of charge for people who need them (they get them now), it might be an advantage. But they get this now; we all have our charity work to do. I have widows whom I don't even charge because it isn't worth while.

REP. GREENWOOD: This would, to a certain extent, relieve you of that.

Ans. I don't think so. We all have our clientele of poor people. I look after it as a part of my business. I wouldn't tell a poor woman, "There is the place for you; I won't go any further with you." Besides, she may have a brother or somebody who has paid me hundreds of dollars.

SEN. BROWN: From your remarks, I glean that you don't use the hospitals for your patients very freely.

Ans. I use a good many. I send patients to the Hale Hospital in Haverhill, and to the Anna Jacques Hospital in Newburyport; I send many people to the wards in the Massachusetts General Hospital—people who cannot afford to pay for their illness. Supposing I have a man with a hernia; the operation to put it back would cost from $50 to $100, and $50 to $75 for a trained nurse, and more for my care. The Massachusetts General Hospital has always seemed perfectly willing to take such a man and operate on him free of charge. Perhaps he may not be in such straits and can pay first cost of $12 or $15; then he is put in a pay ward; but he couldn't afford to pay his surgeon or nurse. If we say he is able to pay his board, they are perfectly willing to take him, and glad to get him.

The point I want to make is this: that, so far as I know, in our rural community, there isn't a man, woman or child that suffers for lack of medical attendance, medical nursing, or medical care.

REP. GREENWOOD: Do you have manufactories in the town?

Ans. The principal business is the making of automobile bodies—Judkins.

REP. GREENWOOD: Do they have any system of doctoring their help?

Ans. We haven't any business that is big enough to employ private physicians. There are a large number of accidents in the machinery. Those injured are allowed to go where they choose.

Population of the town is between two and three thousand.

DR. S. H. CALDERWOOD, of Boston: I represent the Massachusetts Homeopathic Hospital. Our Society feels that this is a great step; a step in the dark, perhaps. We feel as physicians that we are doing a great deal for the sick and for the poor sick, and that perhaps we know more about the poor sick man than members of the laity of this committee, and we simply ask you to give this matter a very thorough consideration before any step is taken, because we do feel that it is a step in the dark.

CHAIRMAN WILSON: You have an out-patient department in connection with your hospital?

Ans. We do. I do not know how many we take care of there, but I can send you the figures.

Our society covers the ground in the same way as the Massachusetts Medical Society.

REP. WASHBURN: Have you any constructive suggestions to make with reference to any bill which possibly might be brought in by me alone?

Ans. I have no suggestions personally, for I have not studied the matter much.

REP. WASHBURN: Do you think the State could pay money in any way to stimulate the people on healthful living and knowledge of the bacillus?

Ans. I see no need of it at the present time. The medical profession is doing it well; there has been a great advance in the last ten years especially, and I see no reason why the State should assume an enormous bill for it.

Dr. Stone introduced Dr. Hurley, a nose and throat specialist, who was a panel doctor in Austria.

DR. JOHN J. HURLEY, of Boston: My first objection to this proposed compulsory health insurance (and I was one of the original objectors) is, that while we are making an intensive study of compulsory insurance, we have also got to make a study of the 14th amendment to the United States Constitution. I do not believe a public health bill can be gotten up and passed that squares with that amendment. I think it is special legislation for a special class.

Taking up the merits of the question very briefly: my somewhat extended experience under the Austrian act has shown me very definitely that compulsory insurance is not a road to immortality. The undertakers are doing the same amount of business. It has caused politics to enter into the medical profession; and if there is any reason why politics should be kept out of the public schools, it is doubly true that they should be kept out of medicine.

One gentleman this morning spoke of the "mediocre doctor." What is a mediocre doctor? He said that certain people were turned away from the services of eminent men at the Massachusetts General Hospital, and on that account would "have to go to a mediocre doctor." If the diplomas of the chartered medical schools are worth anything, there are no mediocre doctors. There are specialists, but the so-called "mediocre doctor," if by that you mean a general practitioner, is perfectly able to take care of these patients, for he is at liberty to call on the so-called "eminent men" of the profession.

DR. EDMUND F. CODY, of New Bedford: Last June at the annual meeting of the American Medical Association, one afternoon in the Section of Preventive Medicine was given over to the subject of compulsory health insurance. Irving Fisher read the leading paper on the subject, and Mr. Hoffmann, a statistician, read the leading paper on the other side. After full discussion and careful consideration of the subject, the Section on Preventive Medicine voted to instruct its delegate to the House of Delegates to oppose the scheme for public compulsory health insurance in every way possible. There were representatives from all the states in the Union. Sitting next to me was a gentleman from China, and he said if he went back at the end of his leave of absence (he is head of the Y. M. C. A. in Shanghai) and took word to his co-workers that health insurance has been endorsed by the American Medical Association, in his opinion it would be the most severe blow that progressive medicine could receive in China.

Massachusetts has contributed to preventive medicine in the United States; for instance, the introduction of vaccine (without pay). At the Massachusetts General Hospital, ether was first given to the world; Bigelow crushed stone in the bladder, and reduced dislocation of the hip joint. These things were done without charge and without legislative supervision. At the Sharon Sanatorium, Dr. Vincent Y. Bowditch has demonstrated to the world that the person afflicted with tuberculosis can be cured in our own climate. This has been followed by state and municipal and village sanatoria throughout the world. It was demonstrated to Massachusetts without cost. Diphtheria antitoxin was given by Massachusetts. It was Dr. Harvey of up-State who wrote into our laws the law of putting free textbooks into the hands of the children of Massachusetts.

In the month of June, 1914, our ambassador to the Court of St. James accepted the presidency of an organization to ameliorate the condition of the poor by establishing mortuaries so the bodies could lie apart from the living during the period between death and interment. The need arose because of the 10,000 single-room tenements and 5000 underground tenements.

REP. WASHBURN: Have you any constructive suggestions to make?

Ans. I don't believe in ringing in the alarm until we need it. In Massachusetts there has been no health survey; there has been no epidemic, no unusual mortality which invites immediate action. New Bedford is a cotton city, and several years ago the Massachusetts Board of Labor and Industries made a request to somebody—I think, the State Commission on Health—that the physical condition of minors in the cotton industry should be investigated. Dr. Safford—a very skilful statistician—was detailed, and he made a search of the conditions in mills, large and small, all over the State. He made a comprehensive report that included every possible phase of childhood and age in the cotton mills. He had one suggestion to make: that in all the cities and towns, adequate facilities should be afforded where the citizens could receive proper dental care.

I do not see that Massachusetts at the present time is suffering from any particular physical deterioration that demands specific action along health insurance. Regarding clinics in various parts of the State, I think they are very necessary, but the matter has not been thoroughly investigated.

REP. GREENWOOD: You think there is room for some investigation of that psychopathic work?

Ans. Yes; really the institutions are crowded, and a number of people who are applying should be under care in the early stage. They get by the doctor just as tuberculosis did years ago; we don't recognize the early stages of mental disease.

BRIEF REPORT OF THE HEARING ON HEALTH INSURANCE BEFORE THE MASSACHUSETTS COMMISSION ON SOCIAL INSURANCE, AT LAWRENCE, OCT. 10, 1917.

BY W. H. MERRILL, M.D., LAWRENCE, MASS.

SENATOR HERBERT A. WILSON: We are going to give the first hour to those in favor of health insurance. We will first be glad to hear from any one who represents any organization which goes on record as in favor of health insurance, if there is an individual who has anything to say in favor of health insurance, and after that hour is up, we will hear any one who has come in late, and has been either in favor of or against health insurance.

MR. MATTHEW BURNS said any system should be of such a form that a lawyer's advice should not be necessary for the workman to obtain its benefits; that the decision of a competent physician should be sufficient.

MR. JULIUS GENS, real estate dealer, inquired if the proposed laws were to be like those in Germany. He said he was pro-German and favored such laws.

MR. JAMES R. MENZIE, a prominent official of the labor union, said labor was not opposed to the principle of health insurance, but was opposed to compulsory contribution by the workman; that the community as a whole should pay all of the expense; said that many of the unions had benefit insurance, paying both sick and death benefits; workingmen were also insured in fraternal orders.

MR. MICHAEL O'BRIEN, representing Allied Trades Unions, said that tonight the representatives of the unions went on record as opposed to contributory health insurance. They were not opposed to the principles of health insurance; they would not oppose a bill compulsory upon the state and employer, but optional with the employee. He favored contributory old-age pensions.

JAMES A. DONOVAN, attorney for the Allied Trades Union, was present at the convention of the American Association for Labor Legislation, when the matter was first discussed, and followed with interest its various phases. Neither he nor his clients believe in compulsory contributory health insurance, and believe that some of its provisions would be very detrimental to the interests of labor; among these were the cataloging and card indexing of employees, which would be used by a large association of manufacturers. This was already being done by the metal trades.

DR. W. J. SULLIVAN, city physician, favored contributory old-age pensions and various forms of relief of the poor which would not have any stigma of charity attached to them. He said the ill and poor of Lawrence did not suffer for necessaries of life or medical attendance. He neither favored nor opposed health insurance, but if adopted should be contributory and administered directly by the State.

DR. M. F. SULLIVAN favored health insurance.

DR. F. D. MCALLISTER: I came here this evening especially in order to receive instructions, rather than expecting to offer much of anything. In the notice which I received of this meeting a question was asked as to what extent poverty was due to illness. It is a very difficult matter to make up one's mind exactly. What sort of illness is considered in health insurance? If we rule out old age, illness is caused in the first place largely by ignorance, by intemperance, and so-called occupational diseases; even the classification under the occupational type is obscure. At the Lawrence General Hospital most of the cases are general diseases that could not properly be classed as occupational, such as pneumonia, typhoid fever, and all constitutional diseases that do not belong to occupation. It is very difficult to form an opinion as to how extensively real poverty is the result of a disease. I have been very much in doubt as to the causation, except in old age and in accident cases.

In the case of any form of health insurance, it seems to me that the people who expect the benefit ought to contribute. Exactly the basis of their contribution I cannot say, but the moral question is a question of right and wrong; it is a question of fair dealing, and I repeat, it seems to me that people who are to receive a benefit should pay for it in some form or other. I belong to an organization that pays benefits during illness. It is universally accepted, this benefit, whether the beneficiary needs it or not, simply that all may feel unembarrassed, and it seems to me that if one is to take it, all should take it. I certainly hope that any proposed act will be better managed than the Workmen's Compensation Act has been; that the patient may have the choice of his own physician; that the State shall do the insuring, and not a private company; that it shall be a state organization, where doctors may have some chance of fair dealing; where a man's bill shall receive some consideration; where fair treatment can be reasonably expected, without humiliation,—a difficulty under the Compensation Act. Some insurance companies are very fair and honorable, and others are exactly the opposite, and well-meaning physicians have suffered a great deal.

REP. BROGNA: May I ask you this one question? You have stated illness is caused by ignorance, intemperance and occupational diseases. Did you put those intentionally in this order according to the number of cases?

DR. MCALLISTER: I think that would be a fair way.

REP. BROGNA: In other words, intemperance belongs in the second place or first place.

Ans. Yes.

REP. BROGNA: You mean to say, Doctor, there are more diseases caused by intemperance than by occupational diseases?

Ans. Yes, in my experience, for it undermines the constitution. I put ignorance first. I placed them in that order intentionally; they occupy that place in my mind.

REP. BROGNA: You mean there is less illness of occupational diseases. Does any disease peculiar to the mill operative occur in Lawrence?

Ans. Wool-sorter's disease, anthrax.

REP. BROGNA: What does it affect?

Ans. The hands and face; it is a very fatal disease. You will see that it is not a common disease.

REP. BROGNA: Is there a disease more peculiar to the mill operative than anthrax?

Ans. Not to the ordinary mill operative that we have here that I know of. There are very few strictly occupational diseases which we have to deal with in Lawrence.

REP. BROGNA: Are many of the mill operatives in your knowledge anemic, the anemia caused by occupation?

Ans. I couldn't say; it would be difficult to say accurately to what the anemia is due, but there are a great many that are underfed and improperly clothed, and are taking very poor care of themselves because of lack of knowledge. A great many of the girls go without any breakfast.

REP. BROGNA: Do you know whether that is because of ignorance or necessity?

Ans. Because they don't get up early enough in the morning. I just mentioned that as a matter of fact. I have been called into the mills, and so have other doctors here in Lawrence to see girls who were suffering from lack of nutrition, who were out late the night before, and got up late in the morning and didn't have time for breakfast. That is a habit of their lives. They have anemia.

MR. EVERETT MORSS, ESQ.: I am going to ask a question that we have heard before. You spoke of the Workmen's Compensation Act, the unsatisfactory time the medical profession had with it, that some companies were quite different from others; the so-called Massachusetts Company changed to the Liberty Company, that was the company organized by the authority of the State, and there are one or two other mutual companies on the side, and I'd like to ask whether the experience with the Massachusetts Company is quite different?

Ans. Yes, it has been in my experience.

NOTES FROM THE DISTRICT SOCIETIES.

DISTRICT CORRESPONDENTS.

Berkshire, A. P. MERRILL, M.D., Pittsfield.
Bristol North, ARTHUR R. CRANDELL, M.D., Taunton.
Bristol South, EDWIN D. GARDNER, M.D., New Bedford.
Essex North, T. N. STONE, M.D., Haverhill.
Essex South, H. P. BENNETT, M.D., Lynn.
Hampden, LAURENCE D. CHAPIN, M.D., Springfield.
Hampshire, E. E. THOMAS, M.D., Northampton.
Middlesex South, WILLIAM C. HANSON, M.D., Belmont.

WORCESTER NORTH DISTRICT MEDICAL SOCIETY.—The second quarterly meeting of the Worcester North District Medical Society was held at the Chamber of Commerce Hall, Fitchburg, Tuesday, October 23, at 1.30 P.M. The speaker was Dr. John T. Bottomley, of Boston.

C. H. JENNINGS, *Secretary.*

Miscellany.

RESOLUTIONS ADOPTED AT MEETING OF NORFOLK SOUTH DISTRICT MEDICAL SOCIETY, THURSDAY, OCT. 4, 1917.

A MEMORIAL.

EDWIN NELSON MAYBERRY, M.D.,
1858–1917.

DR. EDWIN N. MAYBERRY was born February 18, 1858, in Edgartown, Mass. He graduated

from the Medical Department of the University of Vermont in 1882. Practicing for a time in Saugus and in West Warren, Mass., he soon moved to South Weymouth where he found his life work and rounded out a professional career of thirty-two years. He died July 15, 1917, after a prolonged illness.

Conscientious and painstaking in all his work, he gave his whole strength to his profession and was thoroughly absorbed in it. His contact with the sick was marked by great kindness and consideration and by a sympathy which he bestowed upon them to an unusual degree. These traits greatly endeared him to his patients and to the whole community.

Constant in attendance at medical meetings, he kept in close touch with his associates. He also gave freely of his time to advance the interests of his profession and maintain its standards. Dr. Mayberry will be greatly missed by the community which he served and by all who knew him. He will be particularly missed by the Norfolk South District Medical Society, of which he was a most helpful member, and its president in 1912 and 1913. His memory will long be cherished as that of an earnest, wise, faithful and sympathetic physician and friend.

OLIVER H. HOWE, M.D.,
W. A. DRAKE, M.D.,
JOHN C. FRASER, M.D.,
Committee on Resolutions, Norfolk South District Medical Society.

August 1, 1917.

POLIOMYELITIS IN NEW YORK CITY IN 1916.

AN excellent and critical summary of our present knowledge of poliomyelitis is that prepared by a joint committee representing the Public Health Committee of the New York Academy of Medicine and the New York Neurological Society, and published, far less prominently than it deserves, in the *Medical Record* of September 15th, under the heading "Society Reports," and reproduced as follows in the Bulletin of the New York Health Department for October 6, 1917.

"The report of this committee is based on a critical consideration of the testimony before the committee of a large number of experts, including clinicians, epidemiologists, laboratory workers and others. The committee endeavored to find out what has been added to our knowledge of this disease through the studies and experiences of the past year, both in clinical fields and in the laboratory.

"According to the report, 'the "globoid bodies," described by Flexner and Noguchi, 1913, seem to bear a definite relation to epidemic poliomyelitis..... In general, they follow Koch's law of causation; they have not been detected in lesions or conditions other than poliomyelitis; they have reproduced the disease experimentally in monkeys, and they have been recovered from lesions thus produced.'

"After discussing the very considerable natural (or acquired) immunity to infantile paralysis, the conclusion is reached that 'these facts seem to indicate that the natural immunity is not due to a great prevalence of abortive or unrecognized attacks. It is more likely that this immunity is of the same nature as the natural immunity against diphtheria.'

"Chief interest, of course, centers in the problem of communicability. We therefore reproduce this part of the Committee's report in full:

" 'Poliomyelitis is a communicable disease. It is mediately contagious, and slightly immediately or personally contagious. This slight personal contagiousness of the disease seems, from the facts brought out in the last year's epidemic, a thing to be strongly emphasized.

" 'If the Committee's interpretation is wrong, it will have to be shown by further and more careful studies of this phase of the question. Our views are based on the facts given in detail by Dr. Tilney in the appendix. Some of these data are:

" '1. That only a small percentage of cases have been shown to have arisen from personal contagion, and in many of these there is not so much proof as inference.

" '2. That the great mass of the cases arise without any history of personal contagion.

" '3. That multiple or family cases make up only about three per cent., and in more than half of these the members of the family were attacked at about the same time or not sequentially.

" '4. That uninfected and healthy children placed in wards containing infected cases do not take the disease.

" '5. That in an epidemic (summer of 1916) in institutions caring for children and offering a fair mark for the disease, there was no infection except in a few instances. That in day nurseries in New York City, babies brought from their homes for the day and taken back at night, were not infected.

" 'That in urban and rural populations the number of cases per 1000 is greater in uncrowded country districts than in the crowded city.

" '7. That the small number of cases of personal contagion is not explained on a theory of very high prevalence of natural immunity.

" 'On the other hand, there are cases which show, as plainly as clinical evidence can show, that personal or immediate contagion can occur. Although it is slight and the immunity rate is high, yet its existence must at present be reckoned with. We only wish to emphasize its small absolute importance, and to urge against bur-

densome quarantine restrictions based on views of its importance.

"'An infected person, however, can probably communicate the infectious organism to certain agencies, thus making these agencies carriers of the disease. These carriers may be human beings or certain of the lower animals, food, dust and dirt. No insect or animal has been positively identified as the ordinary and active carrier in the spread of the disease, and there is not, as yet, any practical method to detect a human carrier.

"'The evidence that the germs are carried about by agencies which spread the disease is based on many clinical and experimental observations. It seems possible that certain changes occur in the infecting organisms which make it possible for the carrier to transmit the disease, while the infected person does not.'

"Concerning the specific serum treatment of the disease, the report says: 'The statistics of these observations, while extremely suggestive, fail to bring conviction that a specific remedy for this disease has been discovered.' The intraspinal administration of adrenalin is declared to be 'still in the experimental stage.'

"Prophylactic measures, such as spraying the nose and throat and gargling, are deemed not only unavailing, but objectionable, if not injurious, in infants. 'They may tend to make the mucous membrane of the upper air passages more perilous to the microörganism of the disease.'"

DR. SEDGWICK OF M.I.T. URGES SANITARY STUDIES.

PROF. SEDGWICK, who has just returned from a considerable stay in Washington, reports the keenest interest on every hand in the speeding up of technical education, and the extensive recruiting of young men and women for the various technical professions affected by the war. Among other interesting developments, he reports the rapid formation of the Sanitary Corps of the Medical Department of the Army, which is being recruited largely from non-medical sanitarians, such as sanitary engineers, sanitary chemists, sanitary biologists, and trained laboratorians.

Another interesting development is that of the Bureau of Sanitary Service of the American Red Cross, of which Dr. W. H. Frost, a high official of the U. S. Public Health Service, has been appointed director.

The sanitation of the various cantonments, prison camps, and other bodies under military control, naturally rests with the army, while the training stations for the navy are similarly in charge of the medical department of the navy. Military control stops, however, with the actual border of the cantonments, camps and the like, and the legal responsibility for the sanitation of the zones just outside rests upon the state, county, town or other authorities. In many instances, local, county, and even state officials find themselves swamped by the multitude of new problems thrust upon them by the unusual concentration of military population, and it must be obvious to anyone that the care of these circumcantonal zones is a matter of gravest public interest. This is where the U. S. Public Health Service and the Bureau of Sanitary Service of the American Red Cross stand ready to lend their aid, and it is interesting to know that a bill has long been pending in Congress providing for the establishment of a Sanitary Reserve in connection with the U. S. Public Health Service, intended to enable that Service to employ sanitarians not already in its service, such, for example, as experts in bacteriology in our colleges, and non-medical sanitarians. Unfortunately, this bill has not yet been passed, and it is by no means certain that Congress will be able to act upon it at the present session, which is naturally becoming crowded with important matters as it draws to a close.

It is just here that the Bureau of Sanitary Service of the American Red Cross bids fair to be exceedingly helpful, for this Bureau stands ready upon the request of the U. S. Public Health Service, or of any state, county or municipality to establish within the circumcantonal zones, sanitary inspection, sanitary laboratories, and even sanitary supervision for the testing of milk and water, for aid in tracing and controlling epidemics, and for other sanitary work which may be required. Already, on the request of various local authorities, the U. S. Public Health Service and the Bureau of Sanitary Service of the Red Cross have provided men and women inspectors, public health nurses, and even, in a few cases, fully equipped laboratories, to carry on this important work for preventive sanitation.

To supply the personnel required in the Army Sanitary Corps, the U. S. Public Health Service, and the Sanitary Bureau of the Red Cross, a much larger force of young men and young women than is now prepared is required, and Prof. Sedgwick feels strongly that medical schools and departments of bacteriology, public health, hygiene, sanitation, etc., in our universities, colleges and technological schools must in the first place "speed up" in order, perhaps, to turn out their annual product more quickly than usual, precisely as Annapolis and West Point are already doing, and also that the public must lend a hand by advising young men and young women, whose tastes or inclinations point in these directions, to enter at once upon active preparation for the positions which almost certainly await them, both now and in the future.

The problem of the sanitary protection of the

civilian population in times of peace is no less pressing than in time of war. It may, even, be more urgent, because after the war is over, the regular supply of sanitarians will be depleted, lasting burdens of poverty and ill health will be laid upon the population, and those diseases which war and the reduction of vital resistance promote through anxiety, underfeeding and the like, will be heavier than ever. He believes that it is the duty of all educational institutions which are in a position to lend a hand, to do what they can toward turning into the ranks of the technically trained a large force of men and women who shall fill the gaps that are already opening wide in the ranks of the workers. Sanitary engineers, sanitary chemists, and sanitary biologists are already in great demand, with a wholly inadequate supply in sight.

PROGRESS IN COMBATING HOOKWORM.

THE recently published annual report of the Rockefeller Foundation records the results of intensive work on the study and control of hookworm and malaria. The report states:

"During the year 1916 the work of the International Health Board continued to be directed chiefly toward the relief and control of hookworm disease. In coöperation with the government, systematic efforts toward control have now been inaugurated in eight of the Southern states and in fifteen foreign countries, located between degrees of latitude 36 north and 30 south in the tropical and sub-tropical belt, which is the native habitat of the hookworm. New fields of operations in 1916 were Salvador, Brazil, Ceylon, and Siam. Arrangements were also completed to start work early in 1917 in the Fiji Islands, in Papua, and in Queensland, Australia.

"In British Honduras and the island of Barbados, preliminary infection surveys were made, and in the Yangtsekiang valley of Central China a preliminary survey was carried out with special reference to the problem of soil pollution in shallow mining operations.

"The board conducted during the year a series of four experiments in malaria control. Three were finished. The fourth will be completed in 1917. The object of all four experiments was to determine the degree to which malaria could be controlled within the limits of reasonable expenditure and under conditions prevailing in typical farm communities of the South. Gratifying results have been obtained.

"Two commissions were sent to South America. One, composed of six sanitarians, with Maj.-Gen. William C. Gorgas as chairman, visited the republics of Ecuador, Peru, Colombia, Venezuela and Brazil, to study yellow fever conditions. Two definite objects were sought: (1) to determine the status of doubtful endemic centres of infection; (2) to ascertain what measures were necessary and feasible to eradicate the disease from the localities responsible for its dissemination. The second commission investigated medical education and public health agencies in Brazil.

"Active measures to control and prevent hookworm disease are now in operation in Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia; in Antigua, Grenada, St. Lucia, St. Vincent and Trinidad of the West Indies; in British Guiana and Dutch Guiana; in Costa Rica, Guatemala, Nicaragua, Panama and Salvador of Central America; in Brazil, and in Ceylon and Siam of the Far East.

"Four experiments in malaria control were carried out during 1916 at different points in the Lower Mississippi River Valley. In each a different line of investigation was pursued, the object being to discover a practical method of control which the average rural community could afford.

"An experiment was conducted under the administration of the Mississippi Department of Health, with Dr. W. S. Leathers as administrative director and Dr. C. C. Bass of Tulane University as scientific director. The practicability of control through detecting the carriers and freeing them of the malaria parasites was tested. The experiment covered 225 square miles of territory, the size of the communities varying from nine to sixteen square miles, with an average population of 1000. Adjoining communities were taken up, one after another, as facilities permitted, the work in each lasting about four weeks with subsequent visits to insure thoroughness. Blood tests were taken, quinine treatment was given to those found infected. The experiment will be continued in 1917."

COST OF HEALTH SUPERVISION IN INDUSTRY.

A PAMPHLET compiled for the Conference Board of Physicians in Industrial Practice, by Magnus W. Alexander, regarding the cost of health supervision in industry, makes the following statements:

This is the second compilation of the Cost of Health Supervision in Industry, made for the Conference Board of Physicians in Industrial Practice.

The first compilation was published in October, 1916, and comprised data, mostly for 1915, submitted by forty-one industrial plants, with an average of 223,416 employees. The average annual health supervision cost, as then reported, was $1.88 per person. The lowest cost ($0.53) was reported by a metal trades plant employing 385 persons, the highest ($7.79) by a paint factory employing 2448. Some of the reports, however, were approximations only, based on more or less incomplete records or on

a short experience while the work was in its infancy. It was, therefore, decided to make a new compilation, based on longer, more varied and more mature experience.

The details of the later compilation present data for the year 1916 as reported by ninety-nine industrial plants located in fifteen states. The total average number of employees represented was 495,544; the average number per plant was 5005, the maximum 37,107, the minimum 141.

While the average cost per person is $2.50, it is not representative, as the total cost on which the average is based includes that of four plants which render unusual service, giving both medical and surgical attention to their employees at the plant and in their homes as well, besides assuming the medical care of employees' families. Omitting these four plants from consideration, the average cost for the 479,634 employees in the other 95 plants was $2.21.

Where the average cost appears to be unusually high or low, the reason is in many cases indicated in the table itself. The size and character of the medical staff is usually the determining factor. In some cases, the cost is influenced greatly by the number of injuries treated in private or public hospitals, in others by the amount of care given to all injuries whether serious or slight, or by extension of the service to include physical examination of all employees, treatment of sickness of employees at the plant and at home, and even by medical care of employees' families, or by a combination of all these features.

The cost is also influenced, of course, by the kind of work done in particular plants and by the character of the industry. Shops doing very light work, with little hazard exposure, naturally have fewer and less serious accidents than those doing heavy work, particularly where there is much overhead handling of materials, or where many men work in elevated positions, as in the power and light industry. The cost in plants manufacturing chemicals and paint reflects the great care exercised to safeguard the health of workers in those industries.

A total of 3,165,114 cases was reported, an average of more than six cases per person employed, at an average cost of $0.39 per case. The number of cases reported, however, does not include all of the service rendered. In many plants, no record is kept of slight injuries, of injuries redressed, of medical cases treated, of home visits made, or of physical examinations. In others, even the most trivial cases are counted. Furthermore, as "cases" are so varied in gravity and in the time required for treatment, any comparisons of costs per case are not of much value.

The "total medical and surgical cost" includes salaries of physicians and nurses, cost of outside medical and surgical service and cost of medical and surgical supplies, whether or not paid for by insurance companies as a part of the insurance contract; it excludes all compensation for injuries, all overhead expenses, and any wages paid to employees while off duty to have their injuries treated.

The aim of this compilation is to inform employers of the actual cost of health supervision of employees in different industries. To this end, the data were secured from plants engaged in many industries, in light, medium and heavy work, in comparatively safe as well as hazardous operations, and in shops of various sizes and character, located in various parts of the United States. Some are situated in cities where hospitals and specialists are available, some are in small places where such service can be secured only at considerable expense and delay. With the large variety of experience to choose from, each employer can obtain data which will give him a fair idea as to what such service would cost in his own plant.

The chief significance of these data, from a general viewpoint, is that it is possible to give such a large amount of medical and surgical service at a cost which averages only $2.21 per employee per year.

Convincing proof of the economic value of health supervision in industry is afforded by the fact that, when collecting the data contained in this report, it was found that no employer had abandoned the health supervision activities established in his plant. On the contrary, the prevailing tendency has been to invest even more money in extending the service.

SOCIETY NOTICE.

NORFOLK SOUTH DISTRICT MEDICAL SOCIETY.—Stated meeting at the United States Hotel, Boston, Thursday, November 1, 1917, at 11.30 A.M.

Dr. Archibald M. Fraser, of Boston, will read a paper on "The Dakin-Carrel Method of Treating Wounds" for Dr. F. W. Crawford of Holbrook.

Censors' meeting at United States Hotel, at 2 o'clock, following the Stated Meeting.

F. H. MERRIAM, M.D, *Secretary*,
South Braintree, Mass.

RECENT DEATHS.

JOHN QUINCY ADAMS, M.D., a Councilor of the Massachusetts Medical Society, died at his home in Amesbury, Oct. 18, 1917, aged 67. He was a graduate of the Bellevue Hospital Medical College in 1872, and had practised in Amesbury since he joined the Massachusetts Medical Society in 1873.

WILLIAM CALDWELL STEVENS, M.D., died at his home in Worcester, October 17, 1917, aged 62 years. He was born in Barre, Mass., Dec. 16, 1854, was a graduate of Amherst (1876) and of Harvard Medical School (1883) and served as interne at the Rhode Island Hospital. He was a Fellow of the Massachusetts Medical Society.

THOMAS JOSEPH HENRY MCCORMICK, M.D., died of heart disease, at his home in Roxbury, October 10, 1917, aged 42 years. He was a native of Boston, a graduate of Harvard College in the class of 1897 and of Harvard Medical School in 1900. He is survived by his widow, who was Miss Mary E. Donnelly of South Boston. Dr. McCormick was a Fellow of the Massachusetts Medical Society.